

# RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK  
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

## EDITORIAL ANNOUNCEMENTS.

**THE BRITISH AND EASTERN CONTINENTS** edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

**CONTRIBUTIONS.**—Subscribers and others will materially assist in making our news accurate and complete if they will send early information

of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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VOL. XLII., No. 13.

FRIDAY, MARCH 29, 1907.

It has been computed on authority that the total shrinkage in market values of the shares of American railroads during a period of 68 days ending with March 14, inclusive, amounted to the stupendous sum of \$2,097,000,000, not including shrinkage of bonds. But facts even more striking are annexed to the amazing sum total. The contraction has not been attended with a single failure save one or two of the most trifling character; not a single railroad has defaulted on its bonds in connection with the downward movement; no railroad property has gone into a receivership; and yet the tremendous shrinkage has been resisted by no such quick combinations of individual capitalists, including the great banks, as in late years have been looked for in times of panic and crisis, while the aid against stress of money rates rendered by the federal treasury has been slight, transitory and incidental. Financial history in the annals of nations may be challenged for such an experience and, in its strange but cheering lights, it almost seems as if theories of crises and panics rooted in political economy would have to be re-written. Explanations of the anomaly have naturally been many and varied. It has been said that the shrinkage has been a Wall Street contraction, a statement which has its measure of truth but imperfectly explains the absence of failures. It has been said that the railroad securities have been in "strong hands," a welcome fact if it refers to holders that are conservative, disquieting if it means holders who are speculative. More substantial is the reasoning that sets against the downward perturbations of the market, the commercial and industrial prosperity of the land and some recent warnings of financial craft nearing the rocks to reef sail and change tack. But when all these elements have been reckoned up there remains behind us a twelve-month in railroads of amazing paradox. Disquietude of investors has been bracketed with national prosperity. Vast financial outlays of the railroads to promote public necessity and convenience have been met by legislative attack on the revenues which make such improvements possible. Railroad stocks have fallen in the face of dividends increased, and rights to new stock have connoted such a fall of the old stock, so that the more rights a shareholder has possessed the poorer he has been. Intrinsic value, usually so potential a force, has yielded to strange and fantastic workings

of the law of supply and demand. The end is not yet, the major prophets are confused and the minor augurs cannot read the financial viscera. But whatever the outcome of the medley of prosperity-at-large and Wall Street adversity, of railroad regulation and railroad expansion, and of sharp fiscal contraction without disaster, the final round-up, when it comes, will close an epoch rich in strange phenomena for the analysis of historian and economist.

## THE TIE PROBLEM AGAIN.

The report of the committee on ties of the American Railway Engineering and Maintenance of Way Association, which was presented at the annual meeting last week, says in the beginning: "In view of the present condition of the tie supply and the possible future supply, it does not seem wise to adopt as standard large-sized ties (7 in. x 8 in. x 8 ft. and 7 in. x 9 in. x 8½ ft.), and the committee recommends smaller sizes, beginning with 7 in. x 8 in. x 8½ ft., for first-class track and running down to 6 in. x 8 in. x 8 ft. for third-class track." This is proof enough of the difficulty of obtaining large ties. Had the committee recommended what, in their own minds, they must have believed to be the most suitable sizes, considered from an engineering standpoint, they would have increased the proposed sizes rather than decreased them, but apparently they were compelled to adopt, not what they wanted, but what they could get. In another paper presented at the same meeting, Mr. O. E. Selby recommended 20 ties to a 33-ft. rail, each tie to measure 7 in. x 9 in. x 8½ ft. He based this recommendation on a study of the stresses in track superstructure under the loads of present practice. The contrast between these two recommendations, presented at the same meeting, is food for thought.

The committee was also directed to report on the design and use of concrete and steel ties. Only a partial report was made, however, covering the subject of concrete ties. The information presented is instructive, but not encouraging. A record is given of 19 different types of plain concrete and reinforced concrete ties which have been tried in track in the United States and Europe during the last eight or ten years. Almost without exception they have been complete failures wherever they have been tried under reasonably

severe conditions. The causes of failure have all been the same—namely, the lack of elasticity of concrete. Most of the ties broke or crumbled under the rail or in the center of the track, while others were completely destroyed after derailments. This lack of one essential element of a cross tie is inherent with concrete as a material of construction. Various methods have been tried to overcome it, but wood cushion blocks, tie plates and other expedients have all failed alike.

While the report does not include any data regarding steel ties the knowledge gathered piecemeal from other sources is hardly more encouraging than the results summarized for concrete ties. In one or two instances a large number of steel ties have been put in track, and have, apparently, given the best of satisfaction, but the steel tie of to-day is far from being an ideal substitute for the wooden tie.

So far, three serious objections have been raised to most of the existing designs of steel ties: First, the method of fastening the rail to the tie is crude. To this may be largely attributed the decision of the engineers of the Pennsylvania Railroad to take out the steel ties near Mineral Point, Pa., following the derailment of the 18-hour train on February 22. When the wheels were derailed and dropped down on the ties they cut and sheared all, or nearly all, of the fastenings and, in the estimation of the engineers, the damage to track and rolling stock was much greater than had wooden ties been used. As was pointed out last week by Mr. Shand, this decision on the part of the Pennsylvania was in no way a condemnation of the principle of the steel tie.

Second, such steel ties as have been tried have generally proved to be either too weak or too stiff, and have either failed themselves by crushing, or have resulted in broken rails. On the Bessemer & Lake Erie they have had comparatively little trouble with broken rails, but on the New York Central, where some ties of the same design were tried, the rail breakages were enormous. The need for further experimenting along this line is obvious.

Third, metal ties introduce the serious problem of insulation where automatic block signals are installed. This last, while perhaps it is a serious objection at the present time, is not necessarily a permanent or a prohibitive objection. If the time comes when steel ties are uniformly acknowledged to be the only feasible substitute for wood ties and wood ties can no longer be obtained in any quantities, the problem of insulation, if it cannot be solved directly, will have to be overcome by the skill of the signal engineer in devising some system of signaling which will not require one rail to be insulated from the other. The art of signaling is in its infancy, and what has already been accomplished can be far surpassed if the necessity arises. On this score, therefore, the steel tie need not be condemned.

#### THE LEGISLATIVE CAMPAIGNS AGAINST RAILROADS.

The owner of railroad securities, were he to look merely at the volume of railroad measures pending now before our state legislatures, might well be appalled and tremble for his dividends. In almost every large state of the Union the bills swell into multitudes, and they are as varied as they are voluminous. "Crank" bills crude and undigested, jostle measures painfully wrought out by wiser heads or organizations of heads. Rates, lay-outs, taxes, passes, stations, construction, demurrage, hours of labor, commission powers—dozens of other subjects, large or trivial in their range, load the tables of legislative railroad committees who, in these times, if faithful to duty, must be inclined to envy the lot of a jurymen in the Thaw trial. Nor is the number of these measures which become positive law contemptible. Take the Kansas legislature which has just adjourned, as an example though perhaps a superlative one. It had 73 railroad bills before it and passed 10 which, inclusively, reduced rates and the hours of railroad labor, regulated speed of freight trains, prohibited free passes, provided for reciprocal demurrage and enlarged the powers of the state commission. And, in some other states, the gross product of new railroad statutes promises to be as large as in Kansas.

The state of Kansas, somewhat famed for drastic experimentalism in other directions than railroads, must not be passed by without reference to another of its new railroad statutes. The text is not at hand. But its description as a law "to authorize the state board of railroad commissioners to intervene in interstate commerce cases" is rich in suggestion. It outlines a situation which day by day grows more striking, namely, the clash of the powers and jurisdiction of the interstate commission and of state authority.

Theoretically interstate and intrastate commerce seem clearly enough separated; practically they are not so and, at points, they fall into a vague and more or less undefined region of state and federal authority. Just at the present time both federal and state restriction of railroads is being pushed fast and far and collision of the two is inevitable. Indeed it begins to look as though the long and indeterminate conflict of reserved rights of states as against centralized federal power would have, in the regulation of railroads, one of its most interesting and significant readjustments. From such a conflict the real equities may emerge and federal authority thus be a haven of safety for corporation craft distressed by the winds and waves of state legislation.

But, quite apart from the federal beacon light of hope, toward which some of the railroad corporations have begun to turn, there are other grounds of assurance that the legislative campaign against the railroads is not to end in disaster. It takes now a mature man whose mental eye was observant in the early seventies to recall the frenzy of the granger movement of that time against the western railroad corporations. The movement did not include many states, it did not include railroad problems so complex as they are now, and it was not "up against" interstate federal statute as distinguished from the federal constitution, but its violence far surpassed the present anti-railroad campaign which, temper alone considered, must be classed relatively as sobriety. "The western prairies are on fire set by a locomotive spark" is remembered as a lurid newspaper headline of the time that aptly described the legislative and popular outbreak. But the movement ran quickly to seed. Three years sufficed for its undoing. The "Potter law" went down after working but minor and transitory ills; and all this came to pass with granger assent and before the granger organization had lost much of its popular strength. Yet then, as now, the railroad investor, beset not only by the granger terror but by the grim realisms of the financial panic of 1873, was loud in his prophecies of enduring calamity.

The sober study of legislative campaigns against certain vested interests, not all of them railroad interests, like the gust of anti-corporation law-making through which the country is now passing, will always bring to light certain reactionary and conservative forces apt to be overlooked. One of them is the underlying desire of the electorate and its legislative representatives alike not to "hurt" the state; and the instant any such hurt becomes apparent the conservative reaction sets in. Let any attack on honest capital go beyond a certain limited bound and the hurt is sure to reveal itself in contracted enterprise and the slackened industry that constituencies see and feel and are quick to remedy if they can. The principle works out more slowly in the scattered agricultural communities of the west than in the factory and mercantile communities of the east, but it works out just the same; and, in the present period, it is the more likely to work out the quicker because general prosperity is apt to be sensitive to its own interests. If the granger movement beginning in 1873 could so soon die out notwithstanding the sting of industrial depression, even shorter life may be inferred for any really unjust anti-railroad law conceived during the prosperities of 1907. Philosophy may carry the idea further and count amid many evils of our national mania of materialisms one good at least, that is to say, the tendency to resist too radical attack on material interests.

Besides the foregoing principle of comfort bed-rocked in American experience there are minor elements of cheer to be described in the pervasive anti-railroad campaign of the state legislators. Of the new laws not a few are levelled at actual evils. Some of them—like the anti-free pass statutes—positively benefit the railroads financially. Other new statutes are hybrid in their character varying with their local application. For instance new two-cent fare laws that will work hardship to railroads of the far west and northwest may prove fiscal angels in disguise to lines of the central west and east of higher passenger density. Some betterment of the intelligence of state railroad commissions may also be looked for from their new burden of responsibility involving, as it does, liability to judicial review. Finally and from the higher viewpoint it may be said that the anti-railroad legislative drift, in so many states, besides its warning to high finance to stop going wrong and to begin going right has, with all its possible evils, other possibilities of rational readjustment of relations of railroad and state. The new laws bring the two into closer touch and even if the contact is, at first, one of controversy, out of such controversy searched by practical experience come ultimate compromise and peace.

## AN INCREASE IN FREIGHT RATES.

At the present time, in the face of a complex railroad situation, with gross earnings showing a tendency to increase, but not to increase rapidly, and with operating expenses showing a tendency to increase very rapidly indeed, while railroads everywhere are being made the object of political attack, the question whether or not there should be a general increase in freight rates—and, if so, how it should be brought about—is of great and pressing importance. Briefly summarized, the reasons why freight rates should be increased may be stated as follows: There has been a general increase in wage cost, amounting to about 30 per cent. in the last five years. There has been an increase in the cost of materials, amounting to fully 30 per cent., as compared with the schedule five years ago. There is great need for terminal extension at the larger points, but the cost of real estate at these points has increased greatly in the past few years, the increase varying in different localities to such an extent that it cannot readily be expressed by an average figure. There has been a widespread and heavy increase in the burdens placed on the railroads by the communities and commonwealths which they traverse in the form of materially higher taxes. In short, within the past few years, there has been a radical increase in practically everything the railroad has to buy, excepting, possibly, fuel, which has remained more or less stationary, while the transportation which the railroad sells has tended downward, although not quite uniformly.

As against these facts, the objections to an increase in freight rates may be summarized by saying that, in general, the companies are afraid to take any step which may aggravate the hostility of the state legislatures, while a few roads can be cited, like the Lackawanna and the New Haven, the first with its anthracite, the second with its l. c. l. tonnage, which enjoy a better average rate than their neighbors, and are not only able but willing to do business on the present basis. In other specific instances it is probably true that present rates on many commodities are too high, and that the owners and managers are in position to gain rather than lose by a reduction, and would lose rather than gain by an increase. It is of interest to study these outline specifications more in detail with a view to determining, so far as possible, what the necessary and just policy of the railroads should be, although it by no means follows that they will be able to carry out the policy which is just, both from their own standpoint and from that of their patrons, in the face of two-score hostile state legislatures.

President Oscar G. Murray, of the Baltimore & Ohio, points out, as first in importance, a fact in this connection, the moral of which is perhaps not fully appreciated or at least clearly formulated in people's minds. The abnormal volume of traffic which has been brought about by the unparalleled wave of prosperity which has swept over the country has been too great for existing facilities, and it has been almost impossible for the railroads to increase their carrying capacity fast enough to handle it with reasonable promptness and satisfaction to shippers and railroad alike. In the effort to do so, increased equipment, trackage and terminal facilities have been required, and have cost far more than they would have cost several years ago. This much, of course, is known to all. The important thing in connection with it is that the cost of providing the additional facilities has been disproportionately high in comparison with the earnings from these facilities. The railroads, as common carriers, are under strong obligations to provide for their traffic, and they have been forced, during the past year or so, to expend sums in excess of any immediate return, while they have been saddled for all time with the high capital cost incident to providing these facilities at a period when wage cost and material cost are at their highest. Besides all this, it must be kept in mind that a railroad cannot buy materials and employ labor without also employing money, and the cost of this money has been driven up to a point where it is now practically out of reach for new construction, especially for new construction by the roads which need it most, simply because the great facilities needed to handle the great traffic have created a demand for money exceeding the supply. It is scarcely necessary to point out that new issues of railroad bonds are all but unsalable at present, and issues of new stock would entail so great a sacrifice that they are not even to be thought of. Almost the only device left for procuring capital, however urgently it may be required and however strong the security behind it, is the issue of short-time notes, which will probably cost the railroad company 7 per cent., and which are a source of great hazard when issued in sufficiently large quantities by a great number of companies, because

they are a temporary expedient and must be funded at whatever cost, in a few years' time when they fall due.

As regards the increase in costs of material, there are plenty of figures at hand. It has been pointed out by a railroad in the West that the cost of its plate girders has increased nearly 64 per cent. in the last decade; the cost of its pine fencing, 122 per cent.; of pine bridge stringers, 109 per cent.; of oak ties, 65 per cent.; of spikes, 18 per cent.; of rails, 55 per cent.; of cast-iron pipe, 63 per cent.; of car wheels, 53 per cent. In the East the President of the Norfolk & Western writes that the prices of all staple supplies required by his railroad have increased very materially in the last five years, and that in a number of important items the increase has been 50 per cent. or more. The President of the Chicago & Alton writes that within the last ten years the average increase in the cost of material entering into the operation of his railroad is about 54 per cent.

As regards labor, Mr. Felton reports an increase ranging between 15 and 30 per cent. within the past decade. Mr. Johnson reports an increase of 10 per cent., 1907 and 1906. Mr. Murray reports that the advance in wages on the Baltimore & Ohio, 1907 over 1906, will amount to approximately \$2,500,000 a year, and adds: "The trainmen who had their wages advanced in January haul the same train the same distance and are not any more competent than they were in December; the company, therefore, must look to the traffic handled by the road to reimburse it for this heavy increase of expenses. This must come from earnings in the same way that the head of a household looks around for more money to meet the increased cost of supporting himself and his family."

The increase in the burdens placed upon the roads in the form of taxes does not submit of averaging. It is extremely severe in the Northwest and follows no rule nor fixed principle, but represents a constant piling on, which appears, unfortunately, to be based neither upon valuation nor upon earnings, but upon a frank desire to make the railroads pay more, regardless of where the money is to come from. Even on the Norfolk & Western, running through a part of the country where agitation against railroads is less specific and less severe than it is in many localities, the taxes per mile of road have increased 109 per cent. in the last five years.

As regards real estate costs, specially itemized as an important and often neglected item in considering the general upward tendency of prices, it need only be pointed out that the great terminals of the country are already being worked at the limit of their capacity, or close to it. To quote W. C. Brown, Senior Vice-President of the New York Central: "When you talk about increased terminal space on Manhattan Island you have to figure on covering every piece of real estate you want with gold." To all intents the city is driving out its railroad freight terminal business, and the wholesale business must sooner or later follow. The terminal problem in Chicago, in St. Louis, Cincinnati, St. Paul and a long list of other central points is fortunately not quite as bad as it is at New York City, so far as real estate prices governing expansions are concerned, but it is, nevertheless, a problem of the first magnitude, involving not only charges on the first costs of land, but subsequent taxes on gilt-edge property situated directly under the eyes of the tax commissioners.

If undue space has been given in presenting facts already well known, it is only because these facts have changed so rapidly and taken on an aspect so serious within the past year that they must be considered anew. The cost of everything that the railroad buys and of everything which it employs, including not only men but money, goes up and up, and against all this there is but one source of income in the last analysis—the charge for transportation. Even this source of income is under savage attack at present, so far as passenger rates are concerned, in approximately three-quarters of the states of the Union. The present situation, with practically every state legislature concerned in passing bills limiting passenger rates to 2 cents a mile, is an extraordinary one, and the legislative action in the states reflects no study of economics or of operating costs, but seems to be simply a popular craze, a sort of political slogan. That freight rates have not been so widely tampered with cannot be attributed to the fact that the state legislatures are content with them, but to the fact that they come only partially under local jurisdiction, and are not amenable to the same kind of off-hand treatment. This enforced reduction in passenger rates in the thinly populated parts of the country, coming at the same time with universally increased costs of operation, stands as the final reason why freight rates should be increased. Such increases have been made already in some instances.

At a recent meeting of the officers of roads representing the

Eastern Ohio and Western Pennsylvania Coal and Traffic Associations and the Ohio Coal & Traffic Association, a general increase in the rate of bituminous coal was referred to a committee, of which Joseph Wood, head of the Pennsylvania Company, is chairman, and committees were appointed to discuss reclassification of certain commodity schedules and an increase in the minimum carload. As regards grain traffic, there is to be an increase in the rate from Illinois to the seaboard, averaging 1 cent per hundred pounds, effective April 1, and the old distinction between winter and summer rates will be abolished. It is understood that rates to the Gulf will be advanced proportionately, and that the export basis will be advanced from 10 to 13½ cents. Ore, coke and limestone in the Pittsburgh district have also been made subject to a small increase, as have the rates on lumber and various forest products in the extreme Northwest. It will probably be generally agreed that the tendency of the past decade has been that far too great a proportion of total freight has been hauled under the commodity class, especially in trunk line territory, and it seems right and natural that many articles now so apportioned should be redistributed so as to take class rates. With a slight general increase in rates on the commodities having the largest movement, and a better apportionment of general freight into classes, it is probable that satisfactory provision can be made, at least in part, to take up the greatly increased costs of the present period. It is surely important that the railroads mostly concerned should take an active and not a passive attitude in this respect, and should show, in a spirit of all fairness, that their income must at least be adjusted to meet their expenses, and that this cannot be managed if the expenses constantly tend upward and the income constantly tends downward.

#### New Railroad Laws in Vermont.

In the midst of the multitude of words about radical railroad legislation in the central and western states, the modest and conservative state of Vermont has usually been left entirely out of the account; but a reference to the laws passed by the Green Mountain State in the legislative session which ended last December shows that there is no need of going west of the Alleghanies to find examples of drastic railroad regulation.

From the dozen or more of these acts which affect railroads, we summarize the main points as follows:

The most comprehensive railroad act, No. 122, approved December 7, contains 13 sections, and it empowers the railroad commissioners on their own motion to correct any railroad rate found to be unreasonable and fix a time within which the order shall be complied with. Appeal may be taken to the Supreme Court, but this process shall not stay or vacate the order of the commission, unless the court, for good cause, shall order a stay. In case, after such suspension, a rate reducing order of the commissioners is affirmed, the railroad must refund the overcharges to all who have paid the old rate. Railroads are to be held responsible for shipments through to destination, while in the custody of other companies. Tariffs must not be raised except on 30 days' notice. Passes are forbidden, with the usual exceptions. Among those excepted are the railroad commissioners and their employees. Express, parlor car and sleeping car companies are brought within the law; and the term "transportation" includes all vehicles and all service such as refrigeration, storage, etc. Demurrage must not be collected on freight until after four days. Shippers must be furnished with cars within four days; penalty, \$1,000 fine and whatever damage the shipper may have suffered. If a shipper unnecessarily orders or retains a car he shall answer in damages to the road. Where a railroad has complied with an order of the commission to provide additional equipment or rolling stock, it shall not be liable for failure to furnish cars if the failure is occasioned solely by shortage of rolling stock. Both shippers and railroad officers are liable to \$1,000 fine for violation of the law, and the penalty for receiving or giving a rebate is \$1,000 fine, or imprisonment for one year.

Section 20 of a law approved December 13 requires railroads to interchange traffic at connections and to do this fairly as between rivals, where there are two or more connections. The railroad commission has power to determine the times of connecting passenger trains. A competing road aggrieved by an order of the commission in this matter may petition for a hearing and modifications, and the Chief Judge of the Supreme Court may, upon proper petition, hear an appeal from a decision of the commission. Railroads must establish suitable stations and shall not abandon a station without permission from the board, and after public notice. A conductor or engineman running on the time of another train, without proper authority, is subject to a fine of \$1,000. A railroad employing or retaining a conductor, engineman, brakeman, switchman, signalman, train despatcher, train-order operator or motorman who uses intoxicating liquors as a beverage, such fact being known to the President, Superintendent or any Director, shall be fined not more than \$3,000

and not less than \$300; and any such employee intoxicated on duty is subject to a year in the state prison or a fine of \$500.

Act No. 119 empowers the railroad commissioners, when requested in writing by three or more freeholders, to order gates, electric signals or flagmen at railroad grade crossings, and to make suitable regulations for the management of crossings.

Act No. 121 forbids the collection of more than 10 cents excess fare on trains, and the excess must be refunded on demand within 30 days. Act No. 125 provides for the abolition of grade crossings. The commission may act on the petition of the selectmen of a town, or on its own motion. Each railroad must remove at least one grade crossing every year for each 80 miles of its line, unless the commissioners shall exempt it. The exemption must be only for the current year, and be given only after a hearing. Not over one crossing shall be abolished in any one town in the same year without the consent of the town. The commissioners shall designate which crossings shall be removed first. They shall apportion the expense, not over 25 per cent. to the state and 10 per cent. to the town; but where a highway has been laid out since the railroad was built, the town may be assessed 15 per cent. The state shall not be required to pay over \$25,000 a year toward abolition of crossings. The act makes suitable provision for appeal to the courts.

A new railroad commission is provided for, and the members are to hold office for six years, one being appointed every two years. The Governor shall biennially designate a member to be chairman. The commission has the power of a court of record, both at law and in equity. Appeals shall be taken to the Supreme Court in the county where the cause arises. The commission has general supervision of all railroads, both steam and electric; and must examine the road, equipment and other property every year. All accidents must be reported by the roads to the commission, and if a passenger is killed or seriously injured by collision or derailment, notice must be given by telegraph. The board shall inquire into the cause of every fatal accident and into others if it sees fit. It shall hold public investigations if deemed necessary. In public investigations persons known to have been injured are to be summoned, and the state's attorney must be notified so that he can investigate the cause, call witnesses and represent the state at the hearing. The railroad must produce the trainmen, etc., free of expense to the state. The board must publish its conclusions.

The board has jurisdiction to hear and determine questions connected with crossings, location of stations, fences, tracks and bridges, time and connections of trains, issues of stocks and bonds to prevent overcapitalization, and the manner of operating railroads generally. It may establish a uniform system of keeping railroad accounts, making the same conform, as far as practicable, to the systems in use in the other New England states, New York and Canada.

For all these multifarious responsibilities the commissioners are to receive salaries of \$1,200 each, with an additional \$300 for the chairman.

#### The Section Foreman's Work.

The *North-Western Bulletin* has in its February issue portraits of 15 or 20 veteran Section Foremen of the Chicago & North-Western, mostly old-timers, and it is an interesting and unique exhibit. Every railroad man of experience knows that the work done by these men is at the very foundation of our most elegant and dazzling superstructure—the palatial train, traveling at top speed—but not every one, even in the railroad service, realizes the importance of foundations, or what sturdy mental and moral qualities are to be found in this branch of the service. These pictures serve to recall this point. In some of the groups the physiognomy is as fine as would be found in some groups—perhaps the average group—of artists, business men, clergymen, or town or county officials. A list of about 100 of these track men, on the Wisconsin division, contains the names of ten who have been in the service over 30 years, and 15 more whose record extends over 20 years or more. The effete Easterner who still looks upon "the West" as a new country, is by this list reminded of his error. Henry Flentge, Charles Hofert, J. F. Kahl, F. L. Horn and M. Flaherty have been in the North-Western service 40 years or more. The bulletin has articles by some of the section foremen, from two of which we copy:

A. Smith, Iowa.—I have one man who always does Sunday and holiday track walking. I think it is better to have a trackwalker and hold him strictly responsible for this work. He should start over the track at 7 o'clock in the morning and the foreman should be on hand at that time and see that the trackwalker takes the flag and torpedoes and necessary tools, reporting to the foreman when he returns.

On some sections trackwalkers start over the track at 5 o'clock in the morning and return about 7. This should not be done. Track inspectors should start from the toolhouse and not from their homes, and if the foreman is at the toolhouse when the inspector starts there will be better inspection.

J. Brown, Colorado.—In case of heavy rainfall, track men should

make their inspection right then and not wait until the rain is over, or perhaps to get a meal or possibly a few hours' sleep. I have known men that think because they have made their inspection right after the rainfall that the danger is all over. That is when I think the greatest danger comes in, when the high grades and cuts are soaked with water and a slide is liable to take place at any time. Also in sloughs where muskrats have undermined track, it will settle then if at any time. For at least 24 hours after heavy and long rainfalls track should be inspected frequently. In cold weather track should be inspected first thing in the morning, as broken rails are usually found between the hours of 4 and 9. Of course, in extreme cold weather an inspection in the afternoon should also be made.

I think a regular track inspection should be made during hot weather between the hours of 2 and 6 in the afternoon, as then is when the track is liable to get too tight and kink, and especially on double-track where traffic is all one way.

I usually have one man do my track inspection, as it is easier to make one man familiar with the weak points than a half dozen, and no matter what gang it is, there is always a choice, and I think the brightest man should be used for that purpose. In a period of 18 years' service which I have put in for this company as foreman I have never had a car wheel on the ground caused by condition of the track.

The Interstate Commerce Commission, in a tariff circular issued this week, recognizes that "there is a limit beyond which a freight agent cannot reasonably be expected to know the rates for terminal service at distant points." This is a ray of light. Everybody, including the Commissioners, must know that for every station in the country to bill through to every other station, with all conditions for all kinds of commodities fully set forth on the waybill, would be impossible, or, if possible, utterly absurd and unnecessary; but this is the first time that the fact has been officially recognized. Every congressman and every legislator seems to assume that billing freight and making the prices on it are as easy jobs as mailing a half-ounce letter. The Commission's latest circular also brings to light a number of other difficulties which have developed in the application of the 30-day limit rule in the issuance of tariffs. These circumstances and others like them show the wisdom of the Commission's recently reported decision to appoint agents to represent it at Chicago and other principal cities. To continue the old practice of dealing with all complaints directly would be scarcely less childish than for the Supreme Court at Washington to attempt to act as the trial court in the hundreds of cases that come before it yearly. It is not likely that the local representative scheme will go far toward curing the various administrative troubles connected with the revised law, but it will at least put the rate regulating business on a rational basis. If an agent has to spend most of his time in approving commodity tariffs on special lots of scrap iron, or on carloads of water melons returned to shipper because of a slump in the market, it will at least serve to illustrate the beauties of the Texas idea, and possibly promote a return to sensible practice.

#### NEW PUBLICATIONS.

*The Walschaert Locomotive Valve Gear.* By W. W. Wood. New York: The Norman W. Henley Publishing Co. 6 in. x 7½ in.; 193 pages, 38 illustrations in the text, 4 folding plates. Cloth; Price, \$1.50.

In his preface the author calls attention to the lack of a book devoted to the analysis of the Walschaert valve gear and announces that this book is intended to supply the deficiency. It is a pity that he did not devote more attention to the analysis that is lacking and answer more fully than has yet been done, how and why the motion is designed as it is. The opening pages are devoted to a rather elaborate and discursive description of the way in which the Walschaert gear could be developed from the simple direct-connected valve motion, but there is nothing to tell clearly and directly in easily remembered words how the device works, and the reader must study this out for himself, aided by the two valuable adjustable diagrams that accompany the book. In the section devoted to the designing of the motion, there is nothing to indicate the proportions to be adopted between the various parts of the combination lever, the proper location of the attachment of the union link to the crosshead, or the location of the eccentric rod pin in the lower end of the link, of the point of suspension of the radius bar or of any of the details of the motion which are of such vital importance to the proper action of the mechanism. The book, however, does give a good deal of information regarding the operation of the motion that will be of value to those who are to use it. In fact, it is quite essential that enginemen should know what the book can teach. But even this could have been improved by making the engravings to a somewhat larger scale. As it is they are so small, for the most part, that it is exceedingly difficult to decipher the details.

There are a few statements regarding the motion that should be corrected, and one is to the effect that American locomotive designers had been casting about to find something to take the place of the Stephenson gear and hit upon the Walschaert; for the inference is that they did not know of it, which is far from the fact, and the men who stand foremost in its introduction are the ones that are most emphatic in their statements that it possesses no advantage in the matter of steam distribution over the Stephenson gear. More than this, it has been in continuous use for many years on at least one American railroad. Also the statement that it has never been explained why Walschaert never rose above the position of foreman on the Belgian roads, needs withdrawal in the next edition, for it is generally known to be because he was not a technically educated man and so was not eligible for promotion. These are minor matters, but are worthy of correction.

The third division of the book takes up the advantages of the Walschaert gear and recites those that are regularly set forth by its advocates and as generally conceded, closing with a catechism on the motion, in which methods of handling and disconnecting are set forth in a way that will be of value to enginemen, and, with the general description of the operation that has preceded, makes the book worth having.

*The Design of Steel Mill Buildings.* By Milo S. Ketchum, C.E. New York: The Engineering News Publishing Co. 480 pages; 6 in. x 9 in.; 212 illustrations. Cloth. Price, \$4.00.

To the title given above, there is added inside the covers "The Calculation of Stresses in Framed Structures." It might perhaps be better to consider the work as a valuable treatise on framed structures than to think of it as limited to mill buildings, which indeed it is not. Presupposing enough general information regarding steel frame construction to enable one to read intelligently, this work is complete in itself. Starting with the general classification of mill structures, it deals with the weight of trusses, snow, wind, dead and moving loads, and sets forth the methods that should be pursued to sustain them. The chapter on graphic statics is remarkably clear and complete. Starting in with definitions of the equilibrium of forces, it takes the reader through the successive steps of the polygon of forces and beam reactions to their natural goal, in this case, the stresses set up in framed structures. These are handled graphically as well as mathematically and in a manner of extreme simplicity. The whole second part is occupied with this section of the work and extends through 153 pages. It is not until the third part is reached that we come to the subject matter suggested by the leading title of the book; and, here basing the principles upon what has preceded, the subject is treated exhaustively and in a way to hold the attention and interest of the reader. These principles are too often neglected by those who have to do with mill and shop construction, and it will be well to remember the author's statements that "in railroad shops and factories turning out heavy machinery or a similar product, foundations for the machinery are required and convenience in handling material are the most important" considerations, at the same time, where large numbers of men are employed, "the principal items to be considered in designing are light, heat, ventilation and ease of superintendence." Throughout this part, the whole subject is handled with minute and careful attention to detail that leaves little to be desired. This includes not only the ordinary trusses and columns of the building but its covering and the use of corrugated steel for both roof and side sheathing. The floors, foundations and partitions receive due attention, closing the book proper with a chapter on paints and painting. After this there is a chapter on cost estimation, showing the methods that are to be pursued and the allowances that are to be made. Figures from the cost sheets of various firms for different pieces of work are given, with examples of specific jobs.

Part IV. contains a description of a number of notable and typical buildings, and this is followed by a set of carefully drawn specifications for steel mill buildings; ending in a series of problems in graphic statics and the calculation of stresses.

It will thus be seen that the book will serve very well to supplement, not only the elementary books on stresses but the more elaborate treatises on bridge design, and as such it cannot fail to be a most valuable assistant to the student, the engineer and the architect.

*Handbook of Mathematics.* By J. Claudel. Translated and Edited by Otis Allen Kenyon. W. New York: McGraw Publishing Co. 708 pages, 6½ in. by 9½ in.; 422 illustrations in the text. Cloth; price, \$3.50.

This book is another example of the careful and painstaking work that French and German authors put into their scientific publications. The title page states that the book is intended for engineers and engineering students, but it is primarily a reference book in which there is a resumé of the whole range of mathematical science from the rules and definitions of elementary arithmetic to differential calculus. To do this within the compass of a single volume requires brevity and care and a total avoidance of all repetitions. This has been done, and done not in a cursory way, that leaves matters so at loose ends that the value of the book is in-

jured, but thoroughly and well. It would, perhaps, be saying too much to assert that a person totally ignorant of the first elements of mathematics could, by the aid of this book alone, become an expert, but for one who has once trodden the path, even in part, and learned how to work or to use the principles set forth, it should be all sufficient for a regrounding in those principles. In fact, its principal abbreviation from the ordinary text books lies in the absence of the mass of examples for practice which they usually contain. The section on geometry, for example, is greatly abbreviated as compared with the ordinary text book, in its demonstrations, and yet is quite sufficient to brush up the hazy recollections of the man who has once been over the ground. All through the book there are analyses of operations that are invaluable demonstrations of principles, and in this it is much superior to many of the regular text-books that are too frequently content with the mere statement of a rule without any attempt to explain the reason underlying its formulation; thus leaving the student with mere parrot-like information that rapidly fades from the memory unless it is kept in constant service. For those who have learned mathematics from the surface only, and who need an assistant that will bolster them up and help them over weak places, as well as for those whose knowledge is simply rusty from disuse, this translation of M. Claudel's work will be invaluable.

*Annual Report of the Smithsonian Institution for 1905.* Washington, D.C. 576 pages; 6 in. x 9 in. Cloth.

The opening pages of the volume contains the report of the secretary, which, with the appendices, gives a full account of the working of the Institution and the National Museum for the year. Few people have an idea of the magnitude of the work that is being done in those quiet buildings on the Mall, and the growth of the museum is more rapid than its facilities. For example, more than 30 carloads of material in the fields of ethnology, mineral technology and other branches of the useful arts have been received from the Louisiana Purchase Exposition, and this is but a fraction of the whole. In the department of ethnology a great deal of work has been accomplished, especially in the field of Indian research. The work of the astrophysical laboratory has continued in its investigation of stellar heat, and it has now become possible to design a bolometer whose action can be calculated in advance, and by which a sensitiveness, hitherto unattainable, can be reached. These are two of the more important lines of research work that is being prosecuted but are far from being all.

The volume concludes, as usual, with a number of articles of scientific interest and value, culled from various American and European sources. In these, as in previous years, the extracts deal, for the most part, with the refinements of pure science, though there is among them an article dealing at length with the development of the Rhodesian railroads.

*Mathematical Drawing.* By G. M. Minchin and J. B. Dale. London: Edward Arnold. New York: Longmans, Green & Co. 145 pages; 6 in. x 9 in.; 102 illustrations. Cloth.

Most engineers after they have cut their connections from higher mathematics for a time find that there is a haziness that obscures their recollection as to the ways and means to be followed in the quick determination of certain problems that may present themselves. The time required to review past work and brush up on obscure points is sometimes considerable and out of all proportion to the results that are to be obtained. As a guide to a shortening of this time and an assisting in the graphic solution of such problems the book under review will be very valuable. It is not an elementary book and presupposes that a good deal of mathematical theory is within the knowledge of the student. It does not deal at all with the usual problems of dividing straight lines and circles, with which text books abound, but starts in at once with the graphical production of the scale, and the linear representation of it. This is followed by a demonstration of the theory of Amsler's plainmeter and the method to be followed in using the instrument for the determination of centers of gravity and moments of inertia. With such an introduction as this, the book swings naturally into the construction of combs by metrical methods, in a way that is simple and clear, provided only there has been a sufficient preliminary training on the part of the student to understand. The construction of the various forms of the cone-section with certain given details is fully explained. Closely allied to this is the work on the catenary curve. Only a few pages are devoted to it, but those few are so well utilized that, with the instructions given, it should be easy for almost anyone to either draw the curve to meet a given set of conditions or calculate deflections and stresses with accuracy. Other forms of curves such as the Cartesian oval, the oval of Cassini and the lemniscate of Bernoulli, are handled with equal clearness. The book is, therefore, not one that will be in popular demand in ordinary work, but it is one that stands by itself in this peculiar method of grouping and handling the problems that sometimes confront the engineer, and whose solution can be effected most satisfactorily by the graphical method.

## CONTRIBUTIONS

### Are American Railroads Overcapitalized?

New York, March 22, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The General Managers' Association of Chicago has recently issued a pamphlet containing some general data relative to the railroads in the United States and those of the leading European countries. In some instances the figures refer to the operating results of 1904, in others to subsequent years.

However, in the following study the comparisons being compiled in round figures only, they are sufficiently accurate to be used as a basis for argument.

At the outset, it should be noted that the average freight rates on European railroads are 100 per cent. higher than those charged by the American roads.

On the other hand, the average wages received by the railroad employees in the different countries are approximately as follows:

In England they are 50 per cent. lower than in the United States.  
In France they are 65 per cent. lower than in the United States.  
In Germany they are 50 per cent. lower than in the United States.

It should be remembered that in England, a "free trade" country, the cost of living should be lower than in countries where "tariff protection" rules, so that the wage earner over there might be almost as well off as his fellow-laborer on this side, notwithstanding the considerably smaller compensation for his work.

But the farmer, the merchant and the manufacturer in England is charged 100 per cent. more for the transportation of his goods than his competitor in the United States.

It is to be feared that the railroad employees in France, also those in Germany, are not as well off as the workingmen in the United States, for no protective regulations in either of those countries can make up sufficiently for a range of wages ruling from 50 per cent. to 65 per cent. below the prevailing wage schedule in this country. Further, in France and Germany, as in England, the farmer, the merchant and the manufacturer is charged 100 per cent. more for the transportation of his goods than his competitor in the United States.

The following comparative table shows the volume of freight handled by the roads in the above countries, likewise the capital or cost of construction per average mile of road:

	Tons of freight carried per mile.	Capitalization, per mile.
England .....	500,000	\$271,000
France .....	410,000	136,000
Germany .....	770,000	100,000
U. S. A. ....	800,000	64,000

It seems unnecessary to make any comment on these figures; however, it should be remarked that this exhibit is the more striking, when considering the higher wages paid for construction work in the United States. Each of the four countries is amply provided with all material required for the construction of the permanent way and for the building of rolling stock.

Relatively speaking, the people of the United States have considerably more railroad mileage at their command than those in either of the three European countries. In the United States the railroad mileage per capita is four times as great as that in the three European countries under contemplation.

The efficiency of the American roads is also illustrated by the following table:

	England.	U. S. A.
Volume of freight traffic, per mile.....	500,000 tons.	800,000 tons.
Ratio: double track, sidings and yard track*....	130 per cent.	45 per cent.

\*Compared with single track.

These figures clearly indicate the success of the scientific methods adopted in the operation of the American roads, in being able to carry 60 per cent. more freight with 65 per cent. less trackage facilities than the English roads do. Owing to this shortage, principally in double track, it is not surprising that the managers of the American roads, knowing their needs, should urgently demand an increase in trackage and yard facilities for the more rapid handling of the constantly growing volume of freight.

Originally the cost of securing the right-of-way, the laying of a single track, also the acquisition of terminals in the cities, has been effected under favorable circumstances for the railroads, owing to the more sparsely settled and undeveloped condition of the country. To-day, however, the conditions, especially in the larger commercial and manufacturing centers, begin to approach the state of affairs which prevailed in England at the time of the construction of her railroads. In other words, it will henceforth cost the American systems much larger sums to acquire additional trackage and terminal facilities than it did to bring the roads to their present state of development.

In order to satisfy the public demand, it may cost the American roads as much to complete their property as it has cost them up to the present time. Even then, the capitalization of the American

railroads will only amount to one-half that of the average English road.

Practically speaking, after the payment of operating expenses, maintenance charges and taxes, the remainder of income serves to compensate the services rendered by capital invested in the cost of the road and rolling stock. It is paid out either as interest on the funded debt or as dividends on the capital stock.

It is, therefore, important to compare the percentage of net earnings thus available for distribution on the capitalized cost of the railroad systems in the countries under contemplation:

England .....	3 1/2 per cent.	Average of the above	
France .....	4 " "	countries .....	4 1/2 per cent.
Germany .....	6 " "	U. S. A. ....	4 1/2 " "

From this it should be inferred that in the United States the compensation for the use of capital is no higher than the average return received on the investment in railroad enterprises in those three European countries.

D. G. BOISSEVAIN.

#### Prevention of Collisions on Prairies.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I see by your issue of last week that the state of Texas has passed a law requiring all locomotives in the state to be equipped with electric headlights. This law will presumably be classed as a safety measure, for an engine with a 2,000 candle power arc light, backed by a suitable reflector, can easily announce itself at any station when it is still ten miles away, "wind and weather permitting"; and yet a butting collision of freight trains occurred down in that region a year or two since, where both of the trains had electric headlights and were running on straight track. Besides this there was on one of the trains a brakeman riding on the cow-catcher and carrying in his hand a lighted fusee. If the legislature desires a headlight arrangement which will really safeguard trains I would suggest that there be on the front of each engine a row of a half dozen or a dozen 2,000 c.p. lights side by side, part of them preferably red or green. With all westbound trains thus equipped and all eastbound trains forbidden to show any light at all the dangers of competitive dazzling between opposing trains would be done away with and the scheme would be a shining success. Then, by sending men ahead from each train with two red lanterns in their hands and fusees on their heads, the only thing lacking would be a wireless automatic thought-transferring apparatus connecting from train to train.

I admire the electric headlight, but engines which in the perversity of their iron wills are determined to collide, will continue their destructive course, the Legislature of the state of Texas to the contrary notwithstanding.

H. C. E.

#### The Profitable Weight and Speed of Freight Trains.

Baltimore, Md., Feb. 20, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Perhaps you will allow me some space to offer some comments on the communications of those gentlemen who were good enough to criticise in your last issue the table you printed for me in your issue of Feb. 8, in the matter of the most profitable speed at which to run freight trains.

The crux of this question undoubtedly lies in the amount of load cutting required in order to secure increased speeds. My figures were given to me by a former Engineer Officer of the Baltimore & Ohio Railroad as the result of actual tests carried on on this road. Now if we will fix our minds on speeds of 15 miles and 20 miles an hour the difference between my scale and Mr. Worthington's is the difference between 30 and 35. If a running speed of 20 miles an hour can be obtained for a cut of 30 per cent. in a load that allows a speed of 10 miles only, and this running speed would produce an inclusive speed of 15 miles per hour, then my table shows that the 15 miles an hour with the 30 per cent. reduced load would be more profitable than the 10 miles an hour operation. Now it is noted that the running speed of Mr. Worthington's trains, 15 miles an hour, was reduced six miles or to nine miles an hour by delays; for 15 miles in 60 minutes plus 40 per cent. for delays, or 40 minutes, equals 100 minutes for 15 miles, or nine miles an hour. As against this I reduce the running speed for the much lighter load from 20 miles to 15 miles, or five miles, and in view of the notorious fact that dispatchers find the greatest difficulty in giving movement to the present-day heavily loaded freight trains it is quite a fair question whether this five miles is not more than would be required to take care of the delays to the lighter trains. Why cannot we hear from some gentlemen who have had despatching experience on this point? And if the five miles were not required and the running speed of 20 miles gave, let us say, an inclusive speed of 18 miles I could concede to Mr. Worthington the 35 per cent. cut he asks for and still show a profit of some \$5,000 for the lighter load. Let it also be remembered that my reductions in cost per train-mile cover nothing more than a reduction in car repairs on

account of the small number of cars, as I stated in my first letter, and if proper reductions per train-mile were made for less fuel, less overtime, less water and less stores, all of which are entirely warrantable (as to which consider passenger train-mile costs) and further a considerable reduction in the rate of repairs per car-mile, due to less wear and tear, I could concede to Mr. Worthington a 17-mile inclusive speed for a 35 per cent. cut in the load and still show a handsome profit over the 10 mile an hour operation.

It has been a matter of observation how little attention is given by the advocates of the big train load to the heavy increases in costs per train-mile for fuel, stores, delays and wear and tear both to track and rolling stock. On this point it would be interesting to know whether Mr. Henderson in working out his cost per 1,000 ton-miles has made allowance for the important elements of delays and increased wear and tear due to concentration of weights.

It is noted that Mr. Henderson's scale of reduction for increased speed does not agree with Mr. Worthington's. As to this the layman can only exclaim "who shall decide when doctors disagree?"

With regard to the communication from Mr. Daly, of the Illinois Central, it is noted he says that my conclusions must necessarily be in error, and he gives an example to demonstrate his assertion. He produces his results, however, by mutilating my figures, so to speak. As he has commenced this sort of thing I will continue it. Under heading "A" he increases the speed of return empties from 15 miles to 20 miles an hour, or 33.3 per cent. But what is sauce for the goose is sauce for the gander, and to be fair he should increase the speed of the return 28 cars under his heading "B" by the same percentage and give them a speed of say 27 miles an hour. Are not our heavy engines capable of running or is it not safe to run 28 cars, mostly empties, at this speed? If Mr. Daly will give "B" the same advantage as "A" he will find, using the figures of my table, that his "B" trains will earn for him \$40.82 more net revenue than his "A" trains.

With regard to Mr. Daly's adding device to which he calls our attention, I understand this to be a device that increases or decreases the weight of cars according to the distance the car is from the engine. Such a device could not be used on railroads which have their load schedules printed to show adjusted tonnages based on actual experiments of what the engines to be used will do under all conditions of service, and what adjustment per car is necessary. Its use in conjunction with such schedules would clearly be a double addition to the visible weight and result in reducing the load below the proper figure.

There appears to be something radically wrong with the comparison that Mr. Worthington makes of a low class with a high class traffic line, inasmuch as he shows the high class line actually with a lower revenue per ton-mile than the low class line. No wonder the ratio of expenses to earnings of the high class line is much higher considering that it undertakes to do a high class business at a very low class rate. It would also appear that the so-called high class line has a larger proportion of passenger business, and, of course, no one would pretend that the passenger business can be carried on at the same operating ratio as the freight business; not because the passenger train-mile costs more than the freight train-mile, for it costs very much less, but because the passenger train-mile revenue is very much less than the freight train-mile revenue. Nevertheless the passenger train service, where the business is abundant, might be made to earn a larger return on the capital investment required for it than a freight train service running at an inclusive speed at from seven miles to ten miles an hour would earn for its capital investment, owing to the five or six times greater rapidity with which the passenger business is done. An operating ratio is apt to be a very misleading thing.

Finally it is noticeable that while none of my commentators are inclined to agree with my table they all agree that freight trains are not moving fast enough. What then is the matter with our methods? Mr. Worthington says I have a notion that the delayed freight trains in transit are responsible for a large share of the extreme car shortage. Am I wrong in saying that an increase of 50 per cent. in the inclusive speed with which cars are handled for a decrease of 30 per cent. in the number of cars handled would have the permanent result of placing 20 per cent. or one-fifth more cars at the disposal of shippers over what are now available at Mr. Worthington's speed of nine miles an hour or thereabouts? Mr. Worthington speaks about density of traffic, meeting points, etc. It appears to be becoming fairly plain that the filling up of a company's tracks with a lot of new cars before we have learned to give reasonable despatch to the cars already in use would simply block the railroads, and, in fact, induce so much "density of traffic" as to bring the whole business to a standstill.

M. B. WILD.

Union Pacific System,  
Chicago, March 21, 1907

TO THE EDITOR OF THE RAILROAD GAZETTE:

The *Railroad Gazette* of February 8, 1907, contained an article on the profitable weight and speed of freight trains, by Mr. M. B. Wild, from which the conclusion was reached that 25 miles an hour was the most profitable freight train speed, this result having been

obtained by computations showing that more tonnage could be handled by locomotives at that speed than at slower ones, this additional tonnage reducing net revenue sufficiently to offset the higher cost per ton-mile of the faster service.

It seems to me the vital point lost sight of in this computation is that a well regulated railroad would not consider itself operated in the most economical manner unless provided with sufficient locomotives to move all traffic offered and, in cases where the traffic becomes too dense, with additional tracks on which to move it. With such provision, the additional tonnage referred to instead of being moved at 25 miles an hour could be moved at 10 miles per hour at a reduction in cost, according to Mr. Wild's computations, of 25 per cent.; in other words, Mr. Wild's statement referred to is in itself sufficient evidence that for any given amount of tonnage to move, with adequate power to move it, the lowest speed he takes—10 miles per hour—is very much the cheapest. His statement shows that if a railroad had just 2,000,000 loaded car-miles to move, the cost of moving it at 25 miles per hour would be 40 per cent. more than at 10 miles per hour, but that if more traffic is handled the reverse is the case, so that the further computations given to make a lower cost at 25 miles per hour do not seem to be warranted.

W. A. WORTHINGTON.

#### The Necessity for Increasing Rates.

Chicago, Ill., Feb. 16, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Within the last 10 years there has been a very heavy increase in the cost of the materials entering into the operation of railroads. On our line the average is about 54 per cent. The increase in labor runs from 15 per cent. to 30 per cent. In the last 10 years it is well-known that the average rate per ton-mile has decreased. This reduction in rates could not have been made in the face of the heavy increase in expenses but for the enormous sums spent in physical improvement of railroad properties. The reduction of grades and the introduction of heavy equipment combined have reduced the cost of operation and made it possible to meet the situation. Grade reductions on many lines have been completed, heavier equipment has been purchased and is in service, all the economies resulting therefrom have been secured, and now we are face to face with a still further increase in wages and materials; therefore a reasonable advance in freight rates would seem to me to be imperative. The merchant and manufacturer, when he finds his expenses increased, marks up the price of his goods and the public pays the increased cost; why should not the railroads be permitted to do the same thing? It would seem that the railroad is fairly entitled to its share, and I believe that public opinion, which is always right in the end, will support the railroads in any reasonable and proper advance in their rates, especially when it is so distributed as to have no practical effect on the individual consumer.

S. M. FELTON,  
President, Chicago & Alton Railroad.

Roanoke, Va., March 7, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

That there is urgent necessity for advance in rates on the part of transportation companies, in order to meet the increased demands on them from all quarters, particularly the necessity of increasing their facilities and equipment, the interest on increased capitalization, and increased cost of transportation, there can be no question on the part of those familiar with the situation, for the only source of revenue to the carriers is selling transportation.

As an illustration, the increase of about 10 per cent. in payrolls on the Norfolk & Western will represent an increase of \$1,100,000 a year. Taxes show a startling increase. Comparing our taxes for 1906 with 1901, there is an increase of 109 per cent. in rate of taxation per mile of road.

The prices of all staple supplies required by railroads have increased very materially, comparing the prices of December, 1906, with December, 1901, and in a number of important items the increase has been 50 per cent. or more.

There is no doubt that freight rates in many parts of the country and on many commodities, made at a time when trade conditions were at a low ebb and when the cost of operating railroads was at a minimum, are no lower than prevailing commercial and railroad conditions warrant. They should be brought up to standard of reasonableness.

The thoughtful student of the questions before the public today must admit that there is no more potent factor for the general advancement of our commercial well-being, and I think I may say with propriety, our civilization as a great nation, than the fostering of our railroads, since they contribute more towards the development of our country than any other instrumentality. Therefore, any stay of the hand raised for the upbuilding of the waste places of our land, the development and extension of industries must bring disaster to our best interests as a people.

The argument so often and so freely used, which has had much

to do with forming public opinion, that the railroads are paying large dividends and should, therefore, reduce rates, is accepted as sound logic by a large majority of those who are only interested in transportation as shippers or travelers. They do not consider the long period of time during which stockholders either received no dividends or very small ones, nor that in order to prepare for the great development now going on, large sums of money must be spent increasing facilities of every kind, thus increasing interest account, as much of this money must be borrowed. Again, it is a notorious fact that expenses of every sort to which a railroad is subjected, have increased greatly, so it is plain to see that without increased revenue there can be but one result: diminution of net revenue and perhaps in the end bankruptcy, results which can only be averted in one way, namely, increase in rates, there being no other means of producing money by the railroads.

L. E. JOHNSON,  
President, Norfolk & Western Railway.

Baltimore, Md., March 22, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

When we consider that rates in general are very low at present and expenses all along the line have largely increased it would seem that the railroads of the country are perfectly justified in advancing freight rates on certain commodities. The wave of prosperity sweeping over the country has developed an abnormal volume of traffic, and it has been almost impossible for the railroads to increase their carrying capacity fast enough to handle it with reasonable promptness and satisfaction. This has required increased equipment, trackage and terminal facilities, all of which cost much more than they did several years ago.

Rates have always been flexible, decreasing in times of depression and advancing in times of prosperity. The man who places his money in railroad stock has confidence in his judgment that it is a fair investment and he is just as much entitled to a reasonable percentage of profit or interest as the lawyer who defends you in court is deserving of a fee for his professional work. So that there shall be a surplus applicable to dividend payment when striking a balance at the end of the year, the earning power of a railroad must of necessity be regulated by the cost of equipping, maintaining and operating it and the volume of business handled. The earnings come almost entirely from the traffic hauled over its lines, and the extent of gross receipts is dependent on the rates charged for carrying various commodities. The stockholders' dividend, however, would have only a faint influence on rates if the percentage of operating expenses remained untouched. Much of the present prosperity of the country is due to its unexcelled system of railroads and rates of transportation lower than in any other country in the world. Rates are infinitesimally small when compared with the value of the article transported or the cost of supplies to the public.

The cost of running a railroad has largely increased, especially during the past year, while rates remained practically the same. The great increase in motive power during recent years has gone far to decrease the cost of hauling because they pull more cars and much larger tonnage, but the exigencies of trade have demanded more power. There has been an advance in the price of practically everything used in building, maintaining and running a railroad. If the Baltimore & Ohio uses the same quantity of lumber and cross-ties during this year as it did last, there will be an increase in cost of about \$375,000. The same general ratio of increase applies to all kinds of supplies, from a spike to a completed locomotive.

In equipment, it is estimated that during the years 1905 and 1906, as compared with the preceding half-decade, 1899-1904, the increased cost to the Baltimore & Ohio for various kinds of freight cars ranged from 20 to 80 per cent. The increase in cost of steel coal cars and box cars used for hauling coal, grain and merchandise has been heavy. I mention them because they comprise most of the freight car supply of the road, and the addition in cost must be reckoned with seriously. The steel hopper coal cars delivered to the Baltimore & Ohio in 1906 cost about 30 per cent. more than those of the same carrying capacity (of 100,000 lbs.) brought five years before. Last year an 80,000-lb. capacity box car cost 75 per cent. more than one of 60,000 lbs. capacity bought in 1900. While competition and trade demand larger cars of heavier construction and greater carrying capacity, the minimum weight of shipment for carload rating is still much below the hauling capacity of the car built six or eight years ago. In such cases the railroad company is compelled to pay the extra cost for equipment and yet receives no larger ratio of earnings from it.

While the advance in the cost of locomotives has not been as great as in freight cars during the same period, there has been an increase of 36 per cent. in cost of freight locomotives, 18 per cent. for switching locomotives, and 9 per cent. for passenger locomotives. The cost for material used in locomotive and car repair work since 1904 has increased about 14 per cent., and the cost of labor about 8 per cent.

Another important point to be considered is that in order to

handle the increased volume of traffic offered by reason of the industrial development going on along its lines the Baltimore & Ohio has been obliged to make large expenditures. It has been necessary to build much additional track and enlarge terminals. Much of this work is in progress at various points on the system, probably the largest being at Brunswick, Md., where the terminal yards for handling freight are being doubled in size, at a cost of approximately \$1,000,000. Much money is also being spent in terminal improvements at Philadelphia, Baltimore, Wheeling, Parkersburg and Chicago Junction. I particularize in this instance only to show the heavy expense in running a railroad and the necessity of providing earning power to meet it.

Living expenses have also advanced and to meet this and recognize good service railroad employees generally have deserved and received an advance in salaries and wages. The Baltimore & Ohio has been applying the merit system in increasing pay as it does in filling vacancies in the service. Instead of making a horizontal increase, the employees considered most faithful and deserving have been rewarded with proportionate increases of salaries or wages. Earlier in the year the increase of wages of trainmen averaged about 11½ per cent. As a result there has been added to the payroll of the operating department alone nearly \$1,750,000 a year. Since then the increase of wages in the general offices and other departments has made the total advance approximately \$2,500,000 a year. The trainmen who had their wages advanced in January haul the same train the same distance and are not any more competent than they were in December. Now, when they make a trip they get the larger pay for doing the same work. The company therefore must look to the traffic handled by the road to reimburse it for this heavy increase of expenses.

The figures I have given you serve to explain the heavy increase of expenses in railroad operation. This must come from the earnings just as the head of a household looks around for more money to meet the increased cost of supporting himself and family. This country has been enjoying great prosperity and everybody would like to see it continue. The promise of this will be strengthened and the welfare of the country best served by harmonious and co-operative relations between the railroads and the public whom they serve.

OSCAR G. MURRAY,  
President, Baltimore & Ohio Railroad.

#### Freight Traffic on the Great Northern and the Northern Pacific.

The following figures, taken from a booklet called "The People and the Railroads" by Howard Elliott, President of the Northern Pacific, are interesting as showing the distribution of freight traffic by divisions on these two Hill roads and the increases in the calendar year 1906 over 1905. They include all freight, of every kind, passing over the lines:

Northern Pacific System.			
Name of division.	1905.	Ton-miles	1906.
Lake Superior .....	443,349,432	543,473,217	
St. Paul .....	310,446,463	374,497,732	
Minnesota .....	366,305,477	435,157,229	
Dakota .....	420,358,054	502,270,603	
Yellowstone .....	709,197,575	820,403,343	
Montana .....	596,570,601	715,280,829	
Rocky Mountain .....	601,120,741	712,650,905	
Idaho .....	1,072,191,439	1,304,251,530	
Pacific .....	501,940,187	632,467,349	
Seattle .....	67,919,910	86,061,381	

Great Northern System.			
Name of division.	1905.	Ton-miles	1906.
Terminals .....	4,648,406	4,930,217	
Superior .....	198,218,055	228,658,656	
Mesabi .....	939,769,829	972,115,879	
Fergus Falls .....	367,996,470	400,486,039	
Northern .....	181,842,618	246,861,271	
Willmar .....	384,243,992	487,386,193	
Breckenridge .....	207,412,268	250,856,834	
Dakota .....	249,794,380	305,965,824	
Minot .....	328,762,143	432,378,829	
Montana .....	506,036,494	633,912,394	
Great Falls .....	46,810,447	64,989,662	
Sweet Grass .....	26,616,435	28,920,441	
Kalispell .....	292,649,412	359,229,692	
Spokane .....	316,051,516	413,887,833	
Cascade .....	140,370,276	193,919,274	
Montana Central .....	307,061,096	334,510,786	

There is also a comparison of freight density on these and various other roads with comments by Mr. Elliott as follows, the figures being for the year ended June 30, 1906:

Name of road.	Average miles operated.	Freight ton mileage.	Density.
Chic., Mil. & St. Paul....	6,961	4,663,808,007	669,965
Chic. & North-Western....	7,428	5,156,074,115	694,068
Chic., Burl. & Quincy....	8,896	6,347,902,891	713,568
Chic., Rock Island & Pac..	7,218	3,715,621,556	514,766
Soo Line .....	2,020	1,084,153,866	536,605
Great Northern .....	5,906	4,933,530,997	835,287
Northern Pacific .....	5,401	5,245,260,080	971,139

For the year 1905, four eastern systems give the following

figures, showing how greatly density is affected by concentration of business:

Name of road.	Average miles operated.	Freight ton mileage.	Density.
Penn., P. R.R. division....	1,817	11,515,465,537	6,337,525
Pennsylvania R. R. Co....	3,839	16,885,485,241	4,398,407
Lake Shore .....	1,520	5,099,918,804	3,355,209
New York Central.....	3,774	8,421,437,108	2,231,435

The Pennsylvania has four tracks, so has the New York Central. The Lake Shore & Michigan Southern has two. Yet there are many divisions in the Northwest where these records are equaled in the busy months every year. On the Mesabi division of the Great Northern, 115 out of 295 miles being double track, if the business done last October were taken as the standard, the density for the year would be nearly 7,000,000. On the Lake Superior division there was a showing at the rate of 2,800,000 freight ton miles per annum. And for the same month the average of the Montana division would give over 1,800,000 miles for the year.

On the Minnesota main line of the Northern Pacific, from Staples to Fargo, the traffic in October last showed a density for the month of 461,000 miles, which is at the rate of over 5,500,000 per annum. Taking the same month as a standard, the density for the year on the Montana division between Billings and Helena, with a grade of 116 ft. to the mile and a tunnel to pass through, would be 3,500,000. From Helena to Missoula, over the main range of the Rocky mountains and through another tunnel, it would be the same. From Spokane to the foot of the Cascade mountains it would be 3,600,000; and between the Yakima valley and Puget sound, over the Cascade range, with a grade of 116 ft. to the mile, the density falls little below 4,000,000.

#### Uniformity in Specifications for Railroad Construction.\*

The construction and betterment of the subgrade of railroads requires careful preparation of agreements for such work. Much benefit would result from an advance toward uniformity of requirement, increased clearness of specification, and reduction of friction in carrying agreements into effect.

##### CLASSIFICATION.

Nearly all railroads find it useful to retain classifications in their forms of agreement. Such classifications give a solid rock material at one end, and an earthy material at the other, with, generally, as intermediate material called loose rock, and frequently an additional hardpan classification, formerly more common than now.

Classifications grew out of a recognition that different materials varied in cost of removal. Each classification was an attempt at segregating material into groups of approximately similar cost. Having a classification, the contractor could guess with some accuracy, from his experience, the cost of the different materials under the given conditions and eliminate the hazard of their proportion.

Twenty-five years ago an unclassified price was exceptional; to-day much the larger volume of excavation is paid for unclassified. If any tendency can be discerned, it is strongly in the direction of letting all excavation unclassified; or of limiting it to one classification for rock, and another for all other materials. On the part of the railroads there is the argument that classification is prolific of lawsuits, and there is an unfounded belief that an unclassified price prevents them. It is also increasingly difficult in practice for the Chief Engineer really to go into or review any classification.

On different roads classifications are not exact, even by definition, are largely modified by custom, and that custom varies with individual engineers in charge, and, from time to time, even upon the same railroad. However exact the contractor's estimate may be, on what he considers a proper classification, he is practically at sea as to what is to be paid. Should he bid upon an anticipated favorable classification, it might be changed during the progress of the work; if he assumes the unfavorable, possibly he may lose the work. In addition, he thinks that he has clearly detected instances where classification was influenced downward by financial considerations, pressure from the management, preliminary estimates being exceeded, and so on.

As a result of these uncertainties, the writer believes that most of the responsible contractors of to-day, in weighing the two hazards—their own both as to proportion and cost of materials, or the other as to what kind of classification they will get from the engineer—generally prefer to take their own risk upon an unclassified price. In making an unclassified price, either from necessity or choice, the contractor not uncommonly finds difficulty in getting bidding information which is sufficiently clear as to quantities and disposition of material. Some engineers present a profile, but refuse to give quantities in detail, being afraid that claims may be made if there be any change. Contractors, to keep their business going, are compelled to bid in the form in which the engineers, their customers, require. Under such circumstances they make the best approximation possible; but when full information is not available

\*Extracts from a paper by W. F. Dennis, read before the American Society of Civil Engineers, March 6, 1907. Reprinted from the *Proceedings* for January, Vol. 33, p. 39.

there is less competition, and the work goes, not to the best-informed or best-equipped competitor, but to the most optimistic. It is economically wrong to let the work too high or too low, and the engineer is inexcusable who does not secure and present clearly every piece of information that will eliminate the risk of the work as much as possible.

The basis and aim of classifications are to associate in one group classes of material for which the cost of handling is supposed to be approximately the same. The class, location and magnitude of the work, and the kind of equipment which is best adapted to it, have a very important bearing upon the cost, even of the same material. The company agrees to pay definite prices for definite services in a definite time. The contractor thereupon proceeds to perform the service, providing such appliances as his judgment, particular plant, or financial ability will justify. If he knows exactly how he is to be paid, from a well-understood classification, or similarly with an agreed unclassified price, he can then make his calculations as to heavy-plant expense and lower working cost, or the reverse, and longer or shorter time. The classification of a given material should be rigid, for removal by any appliance, and irrespective of quantities or location. If special appliances can reduce cost, competition will make the reduction appear in the price for the classification. The classification should be made, not by names and descriptions of material, but by some definite physical characteristic susceptible of uniform test.

A simple, measurable test, easily applicable, and defining what should be properly in the "earth" classification, is whether or not the material can be plowed in its natural state by a definite plow pulled by a definite number and weight of stock. Whether this material is moved by scraper, grader, cart, car, wheel-barrow, or steam shovel, what is meant is clearly described, namely, a material which a designated plow will produce in shoveling condition. This description excludes from the earth classification some material included in some earth specifications, and includes some material which, in others, is classed as loose rock or as hardpan. If the material is too wet to be plowed, as in case of swamp muck, quick-sands and some gumbos; or is too hard to be plowed, like hardpan, cemented gravel, etc., holding to the proper theory of grouping by rough similarity in cost, no designation by name can properly make it "earth," in a cost sense, for all appliances, although it might be for some. Additional costly work may be required to get the material loaded or transported. In some cases the cost of unplowable earthy material may approximate and exceed that of solid rock; but, speaking generally, the cost is somewhat similar to the cost of loose rock, and such material is most fairly included in that classification.

A composite view of several descriptions of rock and loose rock would reduce to about this: Rocky material which can be removed without blasting is loose rock; and that which cannot is solid rock. The word "can," then, for reasonable interpretation, depends upon some rate of removal. A solid mass of rock might be seamy to the extent of permitting wedging or barring out 1 or 2 cu. yds. per day, but that possibility does not make it loose rock. On the other hand, a certain material might be dug slowly by a steam shovel without blasting. If it could be loaded faster, as a result of blasting, it would be taken out customarily by blasting, but, under the specification, that fact would not necessarily make the material solid rock. On the other hand, the same material, under nearly all specifications, might be solid rock by reason of the impracticability of removing it with pick or bar with reasonable rapidity.

The difference between materials in a construction sense depends on the operations necessary in loading such material on their transporting appliances. Earth is a material which can be reduced to loading condition by plowing, or equivalent inexpensive picking or blasting. Loose rock is a material which generally can be put into handling shape by picking, barring and light sledging, or, in lieu thereof, by moderate blasting, but it is not quite as easy to load as earth. Solid rock is a more refractory material, requiring drilling, strong explosives and general sledging, and, with this additional expense, is not capable of reduction to a loading condition as favorable as the other materials. In seeking for some limit between solid and loose rock, it is impracticable to fix any rate of drilling or quantity of explosive. The condition after blasting cannot be taken as a guide, because that will depend upon the foregoing, as well as upon the cohesion of the material. The requirement of ringing under the hammer is inapplicable; the expression, "continuous blasting," is inexact, and can be worked as a swindle by either side.

It is known that certain soft or fractured rocks can be picked or barred apart with reasonable rapidity, and customary specifications state the fact, but do not state the rate. By definition of that rate the classifications of rock can be clearly defined. The rate of disintegration for loose rock should be within the performance of two men thus employed. A material requiring more than two men working with pick and bar to keep one shoveler busy is certainly a material that "may better be removed by blasting" and which "can only be removed by blasting," in a reasonable sense.

A consideration of importance is the size of the rocky mass that must be exceeded in order to constitute a solid-rock classification. The writer thinks that 1 cu. yd.—the limit most frequently specified—is too high; 3 cu. ft., although right in one view, is probably too low; and that the compromise limit of  $\frac{1}{2}$  cu. yd. would be about right.

The writer proposes the following as an outline classification:

Excavation, excepting foundation pits for structures, elsewhere classified separately as foundation excavation, shall be either classified or unclassified, as may be determined at the time of the contract. If classified, the following classification shall apply:

**Earth.**—Material which in its customary natural condition can be plowed—or is equivalent to a material which can be plowed—with a plow cutting a furrow 10 in. wide and 10 in. deep, drawn by a team of four horses, or mules, each having an average weight of 1,100 lbs., and moving at a reasonable plowing speed, shall be classified as earth.

**Loose Rock.**—The following shall be classified as loose rock: Earthy or mixed materials, not susceptible of plowing under the foregoing test; soft, fractured, disintegrated or other rocky material, soft or loose enough in its natural condition to be barred or picked apart by two men thus employed serving one man shoveling or loading by hand; solid rock in separate masses exceeding 1 cu. ft. each, and not exceeding  $\frac{1}{2}$  cu. yd. The continuous or occasional use of explosives, at the contractor's option, shall not affect the classification, but it shall be governed solely by the test above set forth.

**Solid Rock.**—The following shall be classified as solid rock: Rocky material in masses exceeding  $\frac{1}{2}$  cu. yd., which cannot be broken apart, or displaced from its natural position, except by the use of explosives; and other rocky material which cannot be picked or barred apart by two men thus employed serving one man shoveling or loading by hand.

Where any excavation contains material of more than one classification, the relative percentage of each shall be determined by measurement and observation during the progress of the work.

Experiment will determine whether or not the material can be plowed, and actual picking or barring of the material will determine whether or not two men can keep one shoveler going. Classification becomes, not a matter of opinion, but of demonstration.

For heavy steam-shovel work, the writer's opinion is that there is no especial benefit in a distinction by classification between loose rock and earth, and, for that class of work, a classification for solid rock and another for all other material would be sufficient; but nearly all steam-shovel work involves more or less miscellaneous accessory work for team and hand appliances, and the loose-rock classification is needful for them; furthermore, classification on all work would become better established by its uniform practice.

#### FOUNDATION EXCAVATION.

Experience shows that the reliable unit to be used in computation is the cost of the excavated material per cubic yard. Specifications do not generally define the quantity of material which shall be measured. The following seems to the writer to be reasonable practice and definition:

Excavation for foundations of pipes, masonry or other structures, shall be classified as foundation excavation under the following heads:

**Dry-Foundation Excavation.**—Material of whatever nature, excepting solid rock, found above water level.

**Rock-Foundation Excavation.**—Material, elsewhere defined as solid rock, found above water level.

**Wet-Foundation Excavation.**—All material below water level.

By "water level" is meant the average or mean level during construction at which pumping or bailing becomes necessary in the work of excavating. The quantity of wet excavating shall be computed as a prism having a height equal to the distance between the average level of the bottom of the foundation pit and the water level and a base equal to the area of the foundation course plus 4 ft. all around. The dry and rock excavation quantities shall be computed on a base equal to the bottom area of the wet excavation as above defined, with the necessary slopes to the natural surface.

Wet excavation shall include the cost of excavating, piling, coffer-dams, pumping, bailing, leveling off the bottom, and the expense, of whatever nature, necessary to complete the foundation pit from low-water level to the level finally determined for the bottom, and to maintain the foundation pit open until the structure shall have been placed therein, not, however, including the placing of iron, timber or piles in permanent artificial foundations, these items being paid for under a separate schedule elsewhere described.

The prices for all classes of foundation excavation shall include the cost of removing the spoil, and depositing it in adjoining fills, or of wasting the spoil, if such deposit in fills be not required by the engineer; and also the cost of removing such portions of coffer-dams as the engineer may require, for appearance or for reducing obstruction to the waterway.

#### OVERHAUL.

The overhaul is legally enforceable only upon a specific line shown to the contractor at the letting of the work. Any hardship

that comes upon the contractor, from changes, will legally release him from the contract, unless they are adjusted to his satisfaction. With no overhaul specified, there is no base agreed upon for change.

There is complication in the overhaul question, arising from what is a proper overhaul distance to specify. A 1,000-ft. overhaul on steam-shovel work may be immaterial, but it is a very serious matter for team haul. The difference could be taken up by specifying that locomotive overhaul price shall apply beyond a certain distance, and on team overhaul beyond a shorter distance. On work which, by reason of location, small magnitude, or for other cause, naturally requires hand or team appliances for excavation, the overhaul price would be made for these appliances, and would generally be high enough to require wasting and borrowing before the proper limits of steam-shovel haul were reached. Where steam shovels, wholly or in part, are anticipated, the overhaul price will come down to such an extent that there will be no controversy as to appliances, because it will be uneconomical to make any team overhaul for the price of locomotive overhaul. In sections where scrapers are the ruling appliances, specifications give properly low limits for the commencement of overhaul—300, 500 and 600 ft.; 1,000 ft. is common elsewhere, and, occasionally, 1,500 and 1,600 ft. For team appliances, 1,000 ft. is too high; 1,500 ft. entirely unreasonable. The nonsensical stipulation, of an overhaul after an average haul on the section or contract, has about disappeared, so that nothing need be said in criticism. For steam-shovel overhaul, there is no standard of custom. Some roads pay under the general overhaul; some include it in the yardage price.

There is considerable difference in the practice of estimating overhaul, and confusion as to just what it means. The customary meaning of overhaul is, that every yard of material moved, over and beyond the free-haul distance, is subject to the contract allowance for overhaul. This carries the implication, as is also the common understanding, that the free overhaul distance shall be measured on the route actually taken by the hauling appliance used; that the route be of grades customary for such appliance; and that the appliance be appropriate to the particular case. In the event of, say, a 100-ft. cut into a 100-ft. fill, it can be seen that the question of proper grades and appliances might become very complex. To avoid controversies, the method of measuring overhaul should be stated clearly so that the contractor, in bidding, could cover the ordinary hauls, as well as the special hauls called for by exceptional conditions. The simplest method would be to locate the stations of free haul, and then deal with the cut and fill on either side by locating the station of the center of mass of each. These points could be identified and understood during construction, and the overhaul computation could be checked at any subsequent period. Unless the method of calculating the haul be defined, the common usage will prevail, the effect of which is that, at a later date, no man can check another, or even himself.

#### SUB-CONTRACTING WORK.

It is as usual to see agreements specify that no work is to be sublet as it is to see, in the execution, sub-contractors more or less peacefully performing their assigned tasks. What is the purpose of the prohibition? It is generally a dead letter in the enforcement. The writer cannot think that experienced engineers consider it a system of double profit. If it is, is not the contractor, having obtained his work in competition, entitled to share his profit with the sub-contractor, if he is so generously inclined? The sub-contractor exists because his services in detail, as foreman, manager or contractor, coupled with his financial interest in results, and his special plant, are at times more efficient than can be obtained in other ways.

The most reasonable view is not to prohibit a perfectly business-like arrangement, but frankly admit it, and, in admitting it, control the form. A stipulation that would seem to cover the whole case would be to require the sub-contractor's agreement to read something like this:

"The company and the contractor shall have all rights and power as to the sub-contractor, that the company has as to the contractor, in its contract with him; and the work assigned to the sub-contractor shall be done subject to all the conditions stated in the specifications of the company, or embodied in the contract between the company and the contractor."

#### RIGHT OF WAY.

One of the scandals of railroad construction is the absolute disregard of plain business methods in the acquisition of right of way, and the consequent unfair saddling of useless expense on the contractor. Many engineers allow themselves to be hustled into starting work with immature plans and without right of way. They would have an easier time, save money for everybody, and do the right thing, if they consistently refused to let contracts until these matters were thoroughly in hand.

#### INDEMNITY.

All agreements are elaborate in provisions to save the company harmless against any acts of the contractor during construction. These provisions are proper, provided the contractor is legally liable; they are wrong where the company withholds payments to force the contractor into settlements, whether proper or not. Many agree-

ments recite that in the event that the company is a party to the action, the company may settle without the consent of the contractor and charge against him, together with such legal expenses as the company may choose to fix as its cost of defense. If the contractor, as an individual, is sued jointly with another individual, he must defend himself as best he can. There is no method by which he can recover the expense of defense, either against the party who sued or on account of whom he is sued.

The writer can see no fair ground why the company should be more favored in the case of construction contracts than in any of its other agreements where it takes its chance according to the general law. The fair principle is that, if the railroad pays the contract price, it should get the goods; if the contractor incurs liability, then, by agreement, he should indemnify the company against loss, and the obligation should end there. In accepting the contractor, the company should consider his ability to save it harmless, just as it considers and accepts his ability to perform the work. If the company is sued jointly with the contractor, it may either let the contract or defend, looking to his satisfying any decision, or, if it elects to defend also, it should do so at its own expense, as it would in any other action.

#### POWER AND AUTHORITY OF THE ENGINEER AND OF THE COMPANY.

The powers claimed on the average may be summarized as follows:

Contractor to do the work where and when the engineer shall direct, whether the procedure is, or is not, a reasonable one in economical organization, and whether or not the procedure is fair.

Where the company is in default from any cause, the expense shall be borne by the contractor, his relief is in extension of time, provided he gives notice and the engineer considers the point well taken.

The contractor shall equip his work with such forces and appliances as the engineer shall direct. In case he does not, the company holds the right to employ the force and charge the expense; to annul the contract in whole or in part; to seize the contractor's plant, and to withhold any unpaid sums of money which may then be due. The contractor's employees are subject to discharge by order of the engineer. A reservation of 10 per cent. is withheld from the contractor's payments in addition to withholding, by custom, another part at the discretion of the subordinate engineer. The company, of its own motion, without default on the part of the contractor, holds the right to terminate the contract at any time, to suspend the work, to hold the contractor to resume, with stipulated denial of the contractor's right, not alone to damage, but even for recovery of expense. The contractor must obey all orders of the engineer and accept his determination as final, at a time when the engineer holds the relation of an employee and agent of the company; the contractor knowing at times that the engineer has no detailed knowledge of the work, and that the information which he certifies as his final judgment is, in fact, the work of an assistant, with whom he may not be even personally acquainted.

Requirement that the company shall have the right to save itself in case of claims against the contractors; to make an *ex parte* examination, to settle the controversy and charge the contractor with the award and such expense as the company shall set, without consultation with the contractor, and without his acceptance. Requirement that the contractor shall exhibit complete receipts, showing that all accounts have been paid. Requirement that the contractor shall save the company harmless from every matter growing out of the construction.

Requirement that, before the contractor can get final payment for matters not in dispute, he shall accept the engineer's estimate as a total and release each and every matter and sign in full settlement, with a more drastic wording in some contracts; that the contractor shall have accepted the final, as handed out by the engineer, before the company shall have incurred any indebtedness to the contractor.

Requirement that, after the contractor shall have done work which is satisfactory to the inspector appointed for it, the work may still be condemned and required to be done over.

The stipulation in favor of the contractor is, that he shall have the right to accept without protest the sum of money the engineer shall say is due him.

It is safe to say that in no other business relation between men are such one-sided agreements customary; in no other relation is a man conceived to be clothed, by reason of a written instrument, in a mantle of infallibility, as is the engineer in customary railroad contracts. As far as the writer's observation goes, the average and general result is good, without much genuine offset; but every now and then there is an instance of gross tyranny and outrageous wrong under these powers. The delays, safeguards and forms appropriate for a peaceful civilization would paralyze an active army. Railroad contract work requires somewhat of the army's autocratic directness of control, but the control should be within well-defined and reasonable lines.

The objection in a practical sense, however, comes, not so much from arbitrary or unfair use of the engineer's power, but

from his carrying out, or being forced into carrying out, requirements which are too broad or are unreasonable, which he may have thoughtlessly included in his agreement, put there from mere copying of precedent, or at the suggestion of a legal department which considers only its side of the case. Ordinarily, these clauses are unnecessary. In spite of them, most engineers have to and do make fair adjustments and settlement for the majority of work goes through with mutual satisfaction. With these clauses too strongly drawn, the engineer, in spite of a personal desire to be fair, may be forced by his company into an opposite policy, in accordance with the stipulations of the contract. In no class of cases is there greater real damage done than when organized work is suspended or stopped.

As the writer understands the obligation of contracts, in matters of measurement, classification, workmanship, meaning and application of specifications, and the like, which have to be decided by an expert, and for which the engineer is nominated by agreement as such an expert, his finding and decision will be held final in the absence of fraud. All other matters are at least open to court review. Therefore, a clear, fair contract interpreted by the engineer has a better chance to be upheld in its final than one which

tion reports that none of them fulfils the requirements, but that one designed by an engineer named Bouareau comes so near doing so that they award it the prize of 1,000 rubles (\$516).

#### Grade Separation in Cleveland on the Cleveland & Pittsburgh.

The plans for grade separation in Cleveland on the Cleveland & Pittsburgh, which is operated as part of the Northwest system of the Pennsylvania Lines West, provide for the elimination of 29 grade crossings on the 6.8 miles of line from the southerly city limits to Alabama street. This is being done in accordance with a city ordinance passed in 1902. The work has been laid out in five groups, as shown in Fig. 1. The work under way at present is that included in-group No. 5, extending from the city limits to Jones avenue, 1.1 miles (Fig. 2). This was begun in August, 1905, and is now nearly finished; the work remaining to be done includes only the bridges and the adjustment of buildings to the new grades of Broadway and Harvard street. The line was relocated to the west four-tracked. Before the present improvement there were within these limits 2,120 ft. of single-track road, the only stretch of single track on the road between Pittsburg and Cleveland. There was a

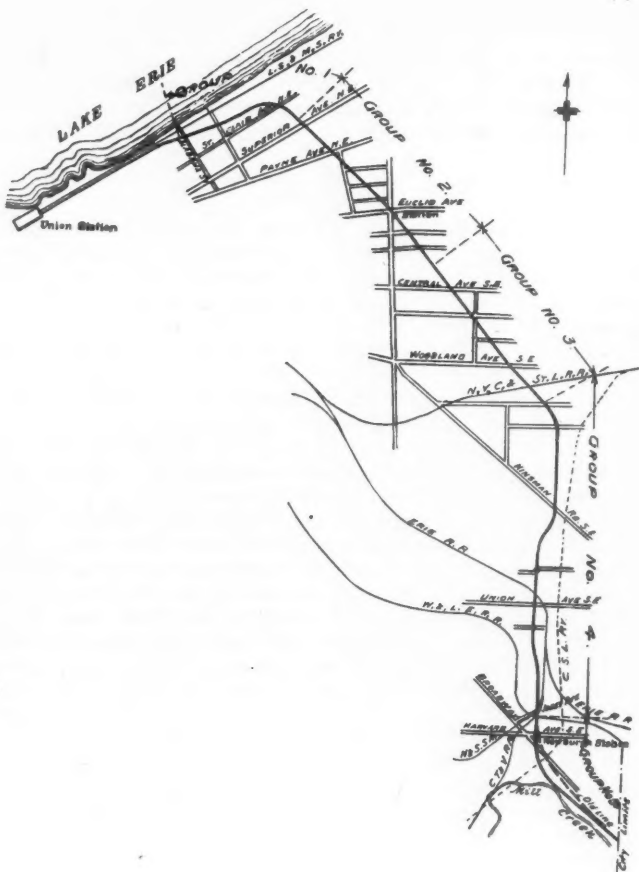


Fig. 1—Grade Separation in Cleveland; Cleveland & Pittsburgh.

is unfair and extravagant in its stipulations in favor of the company. The time has about come for the companies to be willing to assume the risk of their own acts and plans, and not to saddle these risks further upon contractors.

In conclusion, the main thought in this whole discussion is: That a contractor and a company enter into an agreement for mutual benefit. Every matter not clear, subject to whim and opinion in its working out, unfair in its intent, or in the nature of a "strangle hold," is unfair to one side and reacts upon the other, and that the business of both parties is best served by a fair agreement.

Construction methods, throughout the United States, at least, are fairly uniform for like classes of material. There is, however, the widest variation in customs, requirements, specifications and general clauses for the agreements for such work. There is no valid reason why the agreements should not be standardized. A standard form would not interfere with special modifications which might be necessary at times. These matters could be covered by special specifications, attached to the standard form.

Representatives of all the Russian railroads in 1903 offered 5,000, 3,000 and 1,000 rubles as prizes for an automatic coupler which should answer certain specified requirements. The committee which received and examined the models, etc., handed in for the competi-

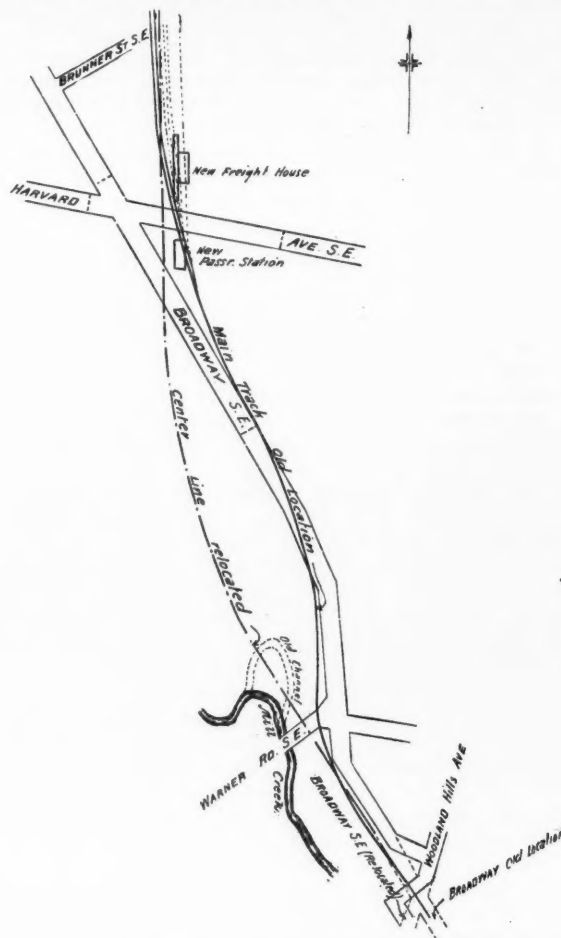


Fig. 2—Section on Which Work Is Under Way.

sharp reverse curve on a 1 per cent. grade; the new location is on a 4 degree curve with a grade of only three-tenths of 1 per cent. The old line crossed Broadway at such an angle that it ran in the street for some distance. The street, therefore, could not be lowered to its new grade while the old line was in operation, so Harvard street and Broadway were excavated near their intersection, a temporary trestle being built across Harvard street to support the old track, and then the new line was built. Fig. 3 shows the new line crossing the two streets on temporary trestles; in the foreground is the street railway track along Broadway and under the trestle to the left can be seen the temporary trestle supporting the old line across Harvard street. Fig. 4 shows both the new and old locations at this point. The excavation of Harvard street and Broadway was then finished, all the excavated material being used for filling on the new line. As it was not possible to lower the building to the new street level during excavation work, concrete piers or wooden posts were used to shore up buildings, and temporary sidewalks were built at the old street grades. New passenger and freight stations were built near Harvard street. The relocation to the west, referred to above, involved the diversion of Mill Creek into a new channel, as shown in Fig. 2, and the filling of the old channel with 120,000 cu. yds. of borrow material, most of which was taken from a borrow pit about a mile south of the city. This material was handled by a 45-ton Vulcan shovel, loading cars of three and four yards capacity which were hauled in ten car trains and

dumped from a trestle over the creek. All this work was done in the winter with two 10-hour shifts a day. The relocated channel and the new fill are shown in Fig. 5.

Retaining walls and abutments are made of concrete, but the bridge seats and copings of sandstone. When concrete was placed during freezing weather it was kept warm by steam pipes running from the steam concrete mixers. The concrete was carried in small cars on trestles from the mixers to the works. Highway bridges at Warner road and Woodland Hills avenue are of the pony truss

type with reinforced concrete floors. All railroad bridges have solid floors, waterproofed with concrete and Hydrex felt. The retaining walls in the passenger station subway are also waterproofed with Hydrex felt and backed with common brick.

For the photographs and description of the above work we are indebted to Mr. R. Trimble, Chief Engineer of Maintenance of Way of the Northwest system of the Pennsylvania Lines West, in whose office the plans were prepared. The work was carried out under Mr. B. E. Tilton, of Mr. Trimble's office.



Fig. 3—Looking South from Intersection of Broadway and Harvard Street, Cleveland.

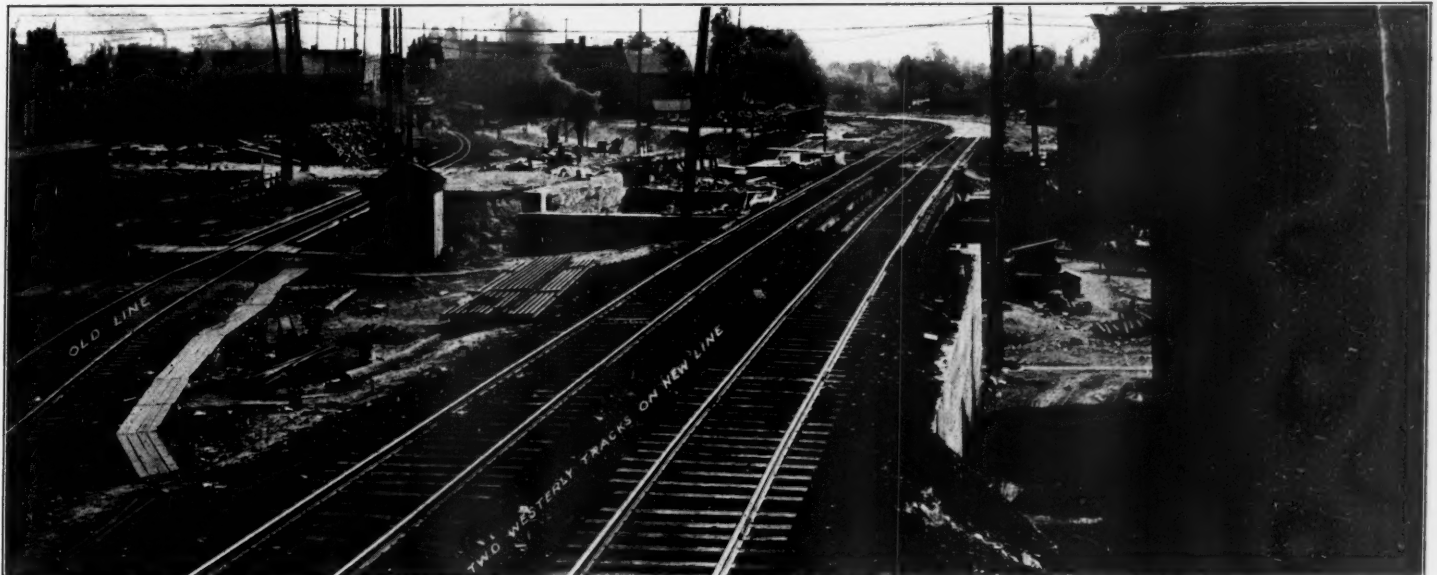


Fig. 4—View from a Point Just North of Harvard Street, Cleveland, Showing Old and New Locations.

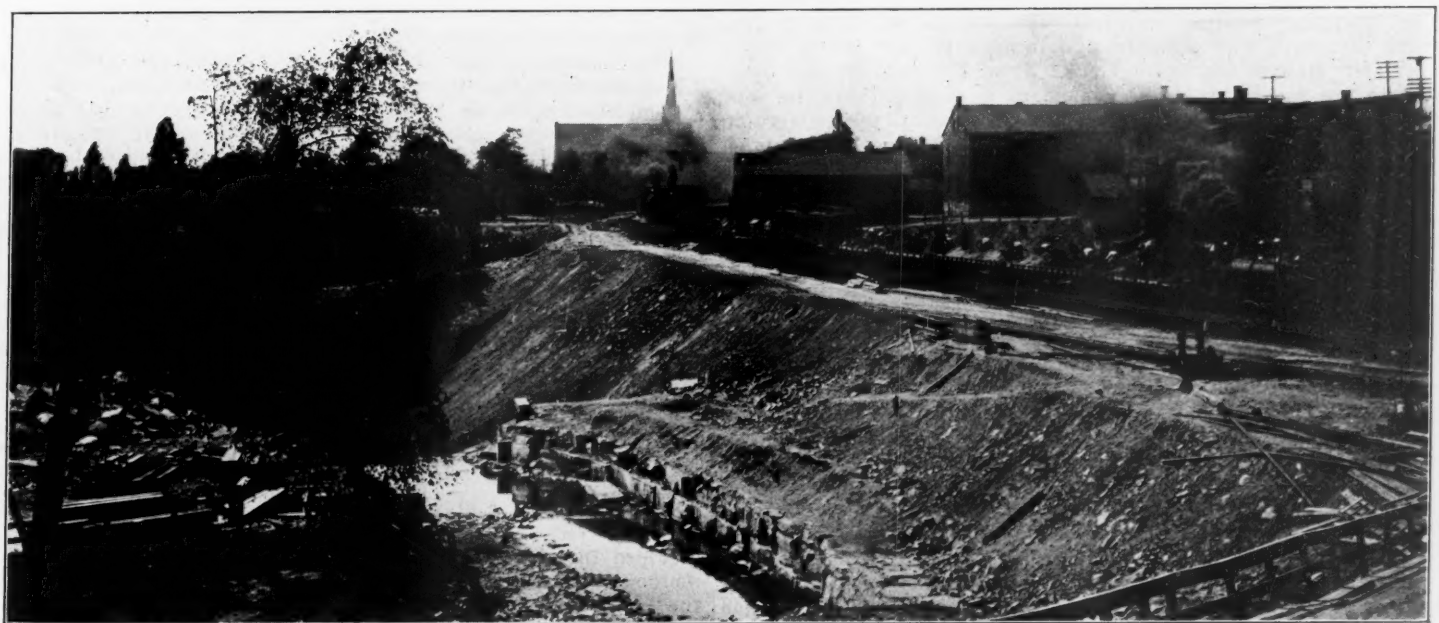


Fig. 5—New Channel of Mill Creek and Fill on New Line in Cleveland; Cleveland & Pittsburg.

**The Engineering and Maintenance of Way Association Convention.**

The eighth annual convention of the American Railway Engineering and Maintenance of Way Association was held at the Auditorium Hotel, Chicago, March 19, 20 and 21. The attendance was fully as great as last year, and more than 200 members registered during the meeting. The present membership is 602, the net gain for the year being 74. The balance in the treasury is \$13,355.

The proposed amendments to the constitution on the matter of membership submitted to letter ballot of the association in February and published in Bulletin 85 were reported adopted. The following amendment to Section 1, Article II., has been proposed and will be submitted to letter ballot: "All members who are members of this association at the time of the adoption of this section shall retain their membership as active members."

The constitution was also amended during the year reducing the term of the office of President to one year. The officers for the ensuing year are: President, A. W. Johnston (N. Y. C. & St. L.); First Vice-President, Walter G. Berg (L. V.); Second Vice-President, William McNab (G. T.); Secretary, E. H. Fritch (re-elected); Treasurer, W. S. Dawley (M. & N. A.), re-elected; Directors for three years, L. C. Fritch (I. C.), and W. G. Besler (C. R. R. of N. J.).

President H. G. Kelley (M. & St. L.) in his annual address spoke of the very great responsibilities resting on this association. The specifications already adopted by the association are considered authoritative standards, emphasizing the need of exercising due care and most thoughtful consideration in their proceedings; no final action should be taken until every feature of the subject has been determined. Reference was made to the representation of the association on The National Board on Fuels and Structural Materials appointed by the President of the United States, which has held two meetings during the year; and to the special committee appointed to confer with a committee of the American Railway Association on the subject of third-rail working conductors and their relation to equipment. This brings the association directly in touch with the matter of electrification of steam roads, and its effect on maintenance of way methods and an operation will require early future attention. The subject of securing funds from the railroads to enable a series of experiments to be conducted to determine the dynamic effect of moving trains on bridges was considered by the board of direction and the proper steps taken to learn whether the member roads would support the undertaking. The indications were declared to be encouraging. The seriousness of the tie timber situation requires the most particular attention of the association. The investigations of the Government Forest Service and its publications on this and kindred subjects affecting the timber supply are of the highest value in this connection.

**DISCUSSION.**

**Uniform Rules, Organization, Etc.**—The rules adopted last year were revised in a number of instances and some new ones added. The revised and new rules were read one at a time for consideration by the convention, and were adopted practically without discussion. The committee accepted a suggestion to incorporate into the rules one requiring track supervisors to look after swinging ties at bridge ends.

The "Rules Governing Supervisors of Structures" submitted in the report were new and were therefore taken up seriatim for consideration. All were accepted as submitted except the last, No. 11, reading: "They shall make from time to time observations of the flow of water of the various streams passing under the track, so as to determine whether sufficient waterway is provided by the present structure, and tabulate this information for future reference." Mr. Hunter McDonald (N. C. & St. L.) thought this delegated to the supervisor duties which, as a general thing, he was not prepared to carry out. After some discussion the paragraph was amended to read: "They shall, in time of flood, observe and record the flow of water of the various streams passing under the track, and report to the proper officer all cases where the waterway provided seems insufficient." It was then thought that the supervisors of track should be required to do the same thing and a motion was adopted to have a similar paragraph included in their rules. The entire report as amended was then adopted and will be printed in the Manual of Recommended Practice of the Association.

**Ballasting.**—The committee asked that the ballast cross-sections for the three classes of track—A, B and C—given in the report be approved as good practice. They were taken up in order.

Objection was made to bringing the sod line over the top of the sub-grade shoulder as the sections showed it, as it would interfere with the drainage. But a number of members whose practice accords with the committee's idea, testified that there was no trouble of that sort, and that the arrangement protected the shoulders from erosion and was of great value in maintaining the edge of the embankment in proper grade and line. The practice was given the formal approval of the association by the adoption of a motion to that effect. On motion, the slope on the stone ballasted section was changed from 2 to 1 to  $1\frac{1}{2}$  to 1. The sections for class A track named crushed rock and slag as the ballast materials. Attention

was directed to the fact that the term "slag" is variable, including materials from the consistency of sand to large lumps. Following some discussion as to the best way to clear the matter, the chairman of the committee suggested leaving the title remain and adding a foot-note explaining the character of slag intended. This and the sections for crushed rock and slag were then approved as amended.

Proceeding to the sections for gravel, cinders, chats, etc., for class B track, Mr. A. S. Baldwin (I. C.) moved that the sod shown on the embankment side also be shown on the cut side with the same width of sod line, and extending through the ditch and up the side of the bank. He said he had followed the practice of the cultivation of sod through ditches for years and found that it affords greater economy in the maintenance of the slope of cut and berm of roadbed than any other method known. It does not interfere with the drainage if the grass is kept cut. If there is much water, tile drains should be provided. The motion was carried. The sections were then approved as amended, and the sections for class C likewise adopted. All sections will be published in the Manual.

**Signaling and Interlocking.**—Action was asked on the conclusions to the report. The first of these provided for the adoption by the association of the specifications for mechanical interlocking adopted by the Railway Signal Association. It was accepted without discussion.

No. 3, providing for the division of expense of the operation and maintenance of interlocking plants on a unit basis as given in the report, was next considered. Asked why the division was not made on a lever basis, it was explained that this often creates a tendency to overload levers by putting more than one unit thereon, to reduce the proportion of expense to certain of the interested parties. Objection was made by Mr. Frank Rhea (P., C., C. & St. L.) to the division of the operation expense on the basis proposed, or in fact on any basis of levers, functions or operated units, as being inequitable. He advocated an arbitrary division of this expense between the interested companies, and moved to amend the conclusion by substituting "renewal" for "operation." The committee signified its willingness to adopt the proposed amendment, largely because it felt that it was not in its province to decide regarding the division of operating expense. The conclusion was finally adopted with the words "installation and renewal" substituted for "operation."

The three provisions of conclusion No. 2 were then read, which recommended the adoption of the principles of giving indications by red, yellow and green lights for night, and of semaphore indications in the upper right-hand quadrant for day, as covered in the report. Regarding the recommended system for night indications, which has been adopted by the Railway Signal Association, the President asked if any of the roads represented in the convention have the system in use, and a number of members replied in the affirmative. A motion to adopt this clause of the conclusion was carried. The other sections of the conclusion relative to day indications were likewise adopted. Mr. Cushing then called attention to the fact that some action was necessary to harmonize the action just taken with the provisions of the Manual of Recommended Practice covering the present system of indications, which it was not desired to stamp as bad practice. The committee therefore prepared and submitted at a subsequent session of the convention the following paragraph as an amendment to conclusion No. 2: "The adoption of the following principles is recommended in view of the recent trend of the development of the art and should not be understood as condemning the present practice indorsed by the association as recommended good practice."

The remaining time of the committee was taken up in reading the indications given in the report as being what was required in a complete system of signals using the principles just adopted, and in answering questions regarding the same, it being desired to get the opinion of the members on the indications needed, for the guidance of the committee this coming year. At its conclusion the committee's recommendations were adopted, also a motion instructing the committee to prepare a comprehensive signal system based on these recommendations, for submission next year.

**Records, Reports and Accounts.**—Action was asked on the five conclusions to the report. No. 1 asked for the adoption as representing good practice Forms M. W. 1,017, M. W. 1,018 and M. W. 1,019. The report explained the workings of these forms. Further explanations were made by the Chairman of the committee, responding to questions of members, and after accepting the suggestion that No. 1,018 bear the further caption "Executive Authority," and 1,019, "Executive Appropriation," the conclusion was adopted. The remaining conclusions were adopted with little discussion.

**Economics of Railway Location.**—In the absence of the Chairman and Vice-Chairman of the committee, Prof. Allen (M. I. T.) occupied the chair. He read the introductory portion of this voluminous report, occupying the first seven pages, and explained briefly the character and points of particular interest in the remaining parts. Members were requested to express their views on various details of the report and to make suggestions for further study by

the committee. The committee also desired to know what the roads were doing along this line and to have the results of any investigations or tests that had been made, the President explaining that it was not alone the problem of train resistance that was confronting the committee, but the broad economical features of location as it will affect the cost of operation and maintenance. Many members related results obtained by grade and curvature changes in particular instances. Mr. M. L. Byers (Mo. P.) told of an experience where tests had shown a certain ruling grade would permit a tonnage of 2,350 tons at 12 m.p.h.; but service results showed the trains had to be cut to about 1,900 tons to avoid excessive overtime. Study of the situation showed the distance between side tracks on single-track lines to be a most important factor. Records taken showed trains lost on the average 20 minutes due to entering and leaving the siding. Distances between sidings required careful consideration in connection with grade reduction. Mr. Berry (C. R. I. & P.) stated that statistics taken on a line from Omaha to Grand Island showed 32 per cent. of the schedule time between termini was occupied in waiting on side tracks. Mr. Baldwin (I. C.) said if the committee's work would develop the economical limit for grade reduction it would supply some much desired information. It was stated for the committee that this matter was under investigation and it was hoped to have something to submit at the next convention. Mr. C. C. Anthony (P. R. R.) said that the relation of signals to the movement of trains might have some bearing on the work of the committee. The discussion also included references to momentum grades—the necessity for, and the objections to them and their disadvantages. The report was regarded as only preliminary in character and no formal action concerning it was taken by the convention.

**Buildings.**—The Chairman of the committee, Mr. Raymer (P. & L. E.), read portions of the report concerning current practice and designs for locomotive coaling stations, and discussion was asked on same. Mr. J. P. Snow (B. & M.) asked if the investigation of the committee had shown any difference in the cost of handling lump coal and fine coal. The committee had no figures, but the President stated that on his road, for certain plants where the coal was shoveled from cars to bins, the cost of handling was raised 1 to 2 cents where certain large lump coal was used, compared to smaller lump coal.

Mr. E. F. Wendt (P. & L. E.) told of a mechanically operated coaling plant where the force running same unload the coal, run the pumping plant, likewise the water treating plant, cleans the locomotive ash-pans, supplies the sand, and the night force does the hostling of any locomotives lying over at the point. It is a main-line plant and serves road engines in a minimum time—a most important consideration on a busy line. In such a plant the storage bins must be kept filled for two reasons: To avoid breaking up the coal badly by dropping to the bottom of the bin, and to have a full reserve supply in case of the plant being disabled.

Mr. Lum (Southern) spoke of a mechanical plant they have at Asheville, N. C., with buildings of reinforced concrete, which is proving satisfactory in all respects.

Mr. Snow (B. & M.) asked if any members were still using the trestle with 25 per cent. incline and power car-haul, and results from same. Mr. Bremner (C. B. & Q.) said they had some, which gave economical results. Mr. Storey (A. T. & S. F.) said they had this type of plant along with others, there being cases to which it was particularly adapted and it is cheaper in first cost. It can serve only two tracks, of course. Mr. Chamberlain, of the committee, said that the Great Northern has mostly this type of plant; also that many western roads had, in renewing trestles with the 5 per cent. incline and switch-engine service, substituted the 20 per cent. incline and power service. Mr. Storey said they used a cable and link attached to the coupler in hauling the car up, with a chain passed around the axle as a safety feature.

Prof. Allen (M. I. T.) pointed out that where a coaling plant was to be placed in a large yard on one of limited room, the necessities of the general yard would influence considerably the type of plant adopted rather than the economy of its performance, the economy of the yard as a whole being the determining factor.

The conclusions were presented for action. It was not desired to have the first one go into the Manual, so that it was omitted and the second one became No. 1. It was adopted, as were the next four, without discussion. No. 6, providing "that where self-clearing cars cannot be regularly obtained, either a locomotive crane or a trolley hoist, using a bucket of the clam-shell type, is desirable," aroused considerable discussion. It was objected that in such an arrangement the committee was proposing to supplement one coaling station by another which involved the use of a locomotive crane, temporarily. The matter was finally adjusted by substituting for "desirable," the words "preferable to unloading by hand," and the conclusion was adopted in that form.

The next conclusion reading "that for a small terminal the two-bucket hoist seems to have good points, where a deep foundation is not too expensive" likewise aroused discussion. The committee was asked what it considered a "small" terminal. Also it was ob-

jected that the conclusion in effect recommended a proprietary device in specifying the two-bucket hoist. It was explained by the committee that while there are in use on a number of roads a two-bucket type of plant that is covered by patents, the committee was recommending a principle—that of self-counterweighted hoists—in naming the two-bucket type, and specified no particular design or make. After further discussion regarding the advantages and performance of this type of plant under the conditions the committee was endeavoring to provide for, the conclusion was adopted after substituting for "small terminal" the words "limited space and small storage capacity."

No action was taken on the last conclusion at the request of the committee, as they desired to amend it or add further information for their next report. Mr. Berg (L. V.) thought the two preceding, which had just been adopted, should receive like treatment, as the three were supposed to present a concise summary of the opinion of the association as to the distinctive cases or characteristics governing the choice of locomotive coaling plants for certain given conditions, and the conclusions were hardly in shape to warrant that opinion. He therefore moved to refer them back to the committee for further consideration and report next year, and the motion was carried. It was suggested that the committee include the matter of ash-handling in its next report.

The matter in the report concerning placing sheds over freight car repair tracks was presented as information.

**Roadway.**—The specifications for a steam shovel for roadway construction were offered for discussion. The recommendations were taken up seriatim and in all but one or two instances were adopted as read, without discussion. The paragraph recommending cable hoist was one of the exceptions. The successful use of cable hoists is comparatively recent and a number of questions were asked the committee concerning the basis for its recommendation. Mr. Bremner, for the committee, said that while there were only one or two makes of shovels using the cables, the results they yielded fully justified the committee in making the recommendation it did; in fact, he thought that even the makers of chain-hoist shovels would not seriously disagree with the recommendation. Mr. Storey (Santa Fe) said that while some contractors claimed the cable hoist is suitable for all conditions, others consider them adapted only to certain classes of material; but he thought the committee's recommendation a proper one for general railroad work.

The conclusions to the report were adopted without discussion.

**Iron and Steel Structures.**—Practically the only matter presented to the convention under this report was that relating to the matter of conducting experiments to determine the dynamic effect of moving trains on bridges. It was desired that the fund for making these experiments be contributed by the railroads, and a circular letter was recently sent out by the President of the association to the different roads represented in the association inquiring regarding their willingness to support the undertaking. A number of favorable answers to this letter were read by the President, most of the roads in question offering to share the expense on a mileage basis. Also a number of members of the convention gave similar replies for their companies. Some companies made even more liberal offers, agreeing to participate with a stated number of other roads to defray the entire expense, if necessary. The provision of funds is thus assured.

The new recording extensometer perfected during the year by Prof. Turneure, of the University of Wisconsin, who gave an explanation of it, was on exhibition at this session of the convention. A drawing of the instrument is shown on the following page. Prof. Turneure's explanation was as follows: "This apparatus is merely an autographic extensometer for recording the deformation of bridge members and multiplying that deformation by some factor like 80 or 90, and recording it on a moving strip of paper. The recording end only of the apparatus is shown here. This is clamped to an I-beam or angle bar, or any projecting corner of a bridge member. There is another clamp connected to the member at a distance of 3 or 4 ft. or greater as desired. The two are connected by a light rod, pipe, or something of that sort by means of a universal coupling. The deformation in that length of member is then recorded, multiplied by the factor mentioned, by means of a single lever. In the interior of the apparatus is a rod, running from the connecting rod to the short end of a lever, where there is a knife edge bearing. The long end of the lever is very stiff and is made of aluminum to be as light as possible. At its end is a pencil to record its movement on a moving strip of paper. Experience with a similar apparatus in which the multiplication was much larger indicated that the points which needed to be observed in the design of such an apparatus was not to have too great multiplication, and to have very rigid and light parts so that the inertia of the moving parts would be as small as possible. I think we have accomplished this to a somewhat better degree than in the Frankel instrument, where the multiplication is something like 140 or 150. Some tentative experiments with this apparatus indicate it will do better work on short members where the stresses vary very rapidly. It has been tried on 10-ft.

I-beam stringers, under speeds of 30 or 40 m.p.h., with quite satisfactory results. I am not sure that it would give such results on such short members under higher speeds, but on girders and members of 15 to 25 ft. and upward, I think the result will be quite satisfactory; certainly for everything above; and for a 30 or 40 ft. plate girder the result will be reliable.

"It is proposed in carrying out experiments of this sort to have eight, ten or a dozen such instruments attached simultaneously to the different parts of the structure; they can be connected up electrically so that the papers can be started in motion simultaneously. Then to move across the bridge a loaded train with whatever type of engine is selected, at different rates of speed. It is not proposed to make calculations of what the stress ought to be, but to run a train at slow speed—10 or 15 miles an hour—and take the stress developed as the static stress; then vary the speed of the train up to the maximum limit.

"The relation between the measured stress and the calculated stress is a question that can be taken up independently of the question of impact; but the question of impact can be got at rapidly for any structure provided we have an experimental train to run over the bridge at any desired speed. By having a number of in-

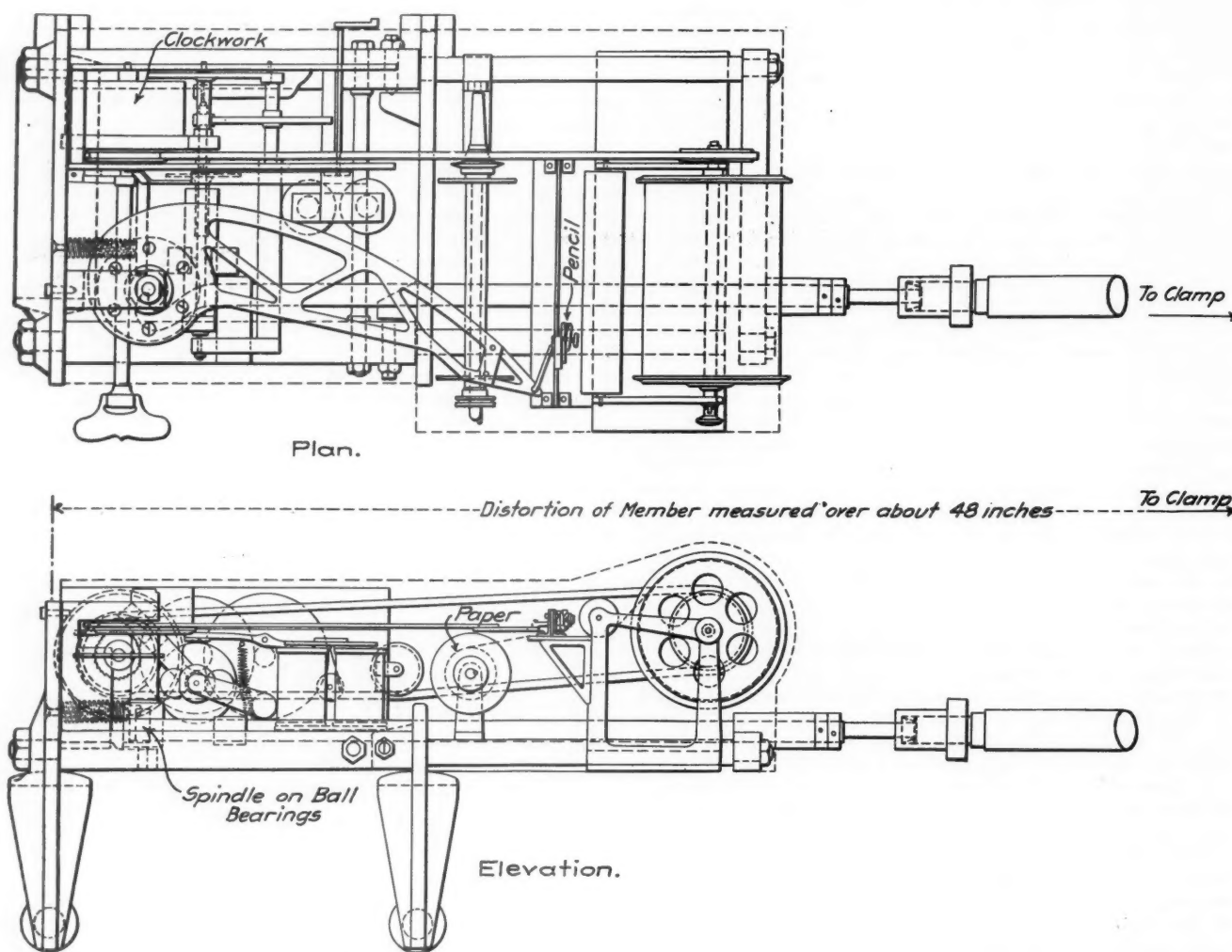
struments, and be bolted together. The edges with most sap shall be placed downward." It was modified to, "Stringers shall be sized to a uniform height at supports. The edges with most sap shall be placed downward."

Clause 25, "Ties shall be surfaced to a uniform thickness and shall be placed with the rough side upward. They shall be spaced regularly, cut to even length and line, as called for on the plans," was revised by changing the first sentence to, "Ties shall be framed to a uniform thickness over bearings."

Clause 26, "Guard rails shall be framed as called for on the plans, laid to line and to a uniform top surface, and spliced at each joint by a half-and-half splice over tie. They shall be firmly fastened to the ties as required," was modified to, "Timber guard rails shall be framed as called for on the plans. They shall be firmly fastened to the ties as required."

The second conclusion asking that the definitions of standard defects of structural timber given in the report be approved, was adopted. The third, asking the approval of the standard names for structural timber, was not adopted, this part being received as a progress report instead.

*Ties.*—There were two conclusions to the report which the



Turneaure's Recording Extensometer.

struments a pretty thorough test can be made on an ordinary bridge in a day's work, or at most in two days."

The President announced that it was hoped to at least start the experiments during the coming year.

**Wooden Bridges and Trestles.**—The adoption of the specifications for workmanship for pile and frame trestles was asked. This was done after the following modifications had been approved: Clause 5 of "General Clauses," reading "Holes must be bored for all spikes and drift bolts, etc.," was revised by striking out "spikes and drift."

Clause 12 under "Detail Specifications" read, "All piles shall be carefully selected to suit the place and ground where they are to be driven. When required by the engineer, pile butts shall be banded with iron or steel for driving, and the tips with suitable iron or steel shoes; such rings and shoes will be furnished by the railroad company." This had the words "rings and" stricken out.

Clause 23 read, "Stringers shall be sized to a uniform height. They shall be laid with alternating joints, provided the plans indicate a length to extend over two panels. If required, the stringers under each rail shall be provided with packing spools or sep-

arate desired adopted. The first provided that the standard tie for class A track be 7 in. x 7 in. x 8½ ft.; for class B track, 7 in. x 8 in. x 8 ft., and for class C track, 6 in. x 8 in. x 8 ft. It evoked a long discussion involving many expressions of opinion regarding the suitability of the sizes recommended, particularly that for class C track, to which strong objection was made by a number, the availability of suitable ties, the effects of different tie sizes on maintenance, etc., in which it became evident that the subject had many viewpoints. Space will not permit giving even an abstract of this discussion here. Near its conclusion Mr. Berg (L. V.) pointed out that the utmost care needed to be exercised in adopting a conclusion of the character of the one proposed, as it would undoubtedly be most far-reaching in its effects, and in its abbreviated form, without any qualifications, its adoption might produce results of an undesirable and serious character later on. The committee now had the benefit of full and free discussion on the floor and he moved that the conclusion be referred back to the committee for report at the next convention. After some further discussion, in which members of the committee objected rather strongly to the proposed

action, the motion was adopted. The committee then asked for an informal expression from members present regarding the suitability of recommending any standard size of tie, but acting on the suggestion that it would be better to obtain the sense of the entire association on this point, a motion to have this done during the year by letter ballot was adopted.

Conclusion 2, relative to the specifications for tie treatment, was adopted without discussion.

*Signs, Fences, Crossings and Cattle-Guards.*—There was only one conclusion to this report. The committee desired its adoption. It embodied the committee's recommendation that a swing board right-of-way gate be used where highway traffic is light and a hinged board or hinged tubular wire gate at other points, depending on cost. The conclusion was adopted without discussion.

Mr. McDonald (N. C. & St. L.) spoke of automatic highway crossing alarm bells and asked if members could cite experiences from their use. He thought there were possibilities connected with their use that affected unfavorably their desirability. Mr. Johnston (N. Y. C. & St. L.) thought it was a matter of the particular device used, one he had had experience with having given satisfaction.

*Track.*—The report contained recommendations regarding turnouts and turnout material, including the best types of switch stands, switch points, frogs, guard rails and throat clearance. The recommendations were considered separately. Objection was made by some members to the lengths of switch points recommended, some thinking the 10-ft. length would give too sharp an angle in certain

ferred back to the committee for further consideration and for conference with the committee on signaling and interlocking.

The recommendation on split switches was referred back to the committee, with instructions to consider in connection therewith the matter of the use of a facing-point switch with unbroken main line rail, for high speeds.

Switch points were recommended to be made of open hearth steel. Mr. McDonald said that while this is desirable, there is much doubt about its practicability. Information being asked on this point, Mr. G. W. Parsons, formerly of the Pennsylvania Steel Company, said that if the section of rail to be used by a road for this purpose is the A. S. C. E. standard it ought not to be very difficult for the switch manufacturer to arrange for a supply of rails of open hearth steel of the various weights. He thought though that the specification for open hearth steel is a little too broad. Some very poor steel might be put into a rail that had been cast from an open hearth ingot. It might not be at all suitable for it, and if an association so powerful as this undertakes to deal with this subject it should be looked into very carefully and not only specify the process as open hearth or Bessemer, but specify the limitations of the deleterious elements and conditions of drop tests, etc.

Another point raised was concerning the height of the stock rail relative to the switch point. This brought out discussion regarding the desirability of having the switch point elevated above the stock rail, as against equal heights for the two. Both practices were represented in the convention. The report recommended elevation of the point. While the switch recommended by the committee was declared a distinct advance over general practice, there were some points which were thought to need reconsideration, and on motion the subject was referred back for that purpose.

The recommended length of 15 ft. for frogs was objected to. Some thought there should be no limitation placed on the length. Mr. Kittredge (N. Y. C.) pointed out that where electrical appliances are used, with a frog of ordinary length it is hard to get a properly insulated joint at the heel of the frog. Mr. Clausen (C. & St. P.) indorsed this from the signalman's standpoint.

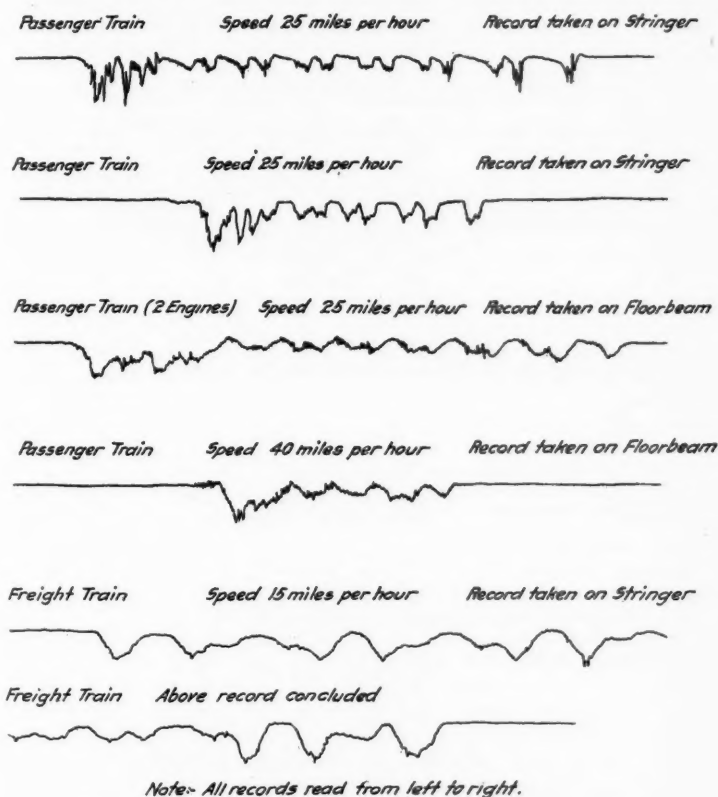
Mr. Ewing (P. & R.) moved that in view of the recommendation for the use of open hearth steel for frogs and that manganese steel for yard frogs is the most economical, the paragraph be referred back to the committee. The latter part of the recommendation he thought not always true, it depending on traffic conditions and the life of an ordinary rail frog. Mr. A. W. Newton (C. & B. & Q.) said they had been investigating the manganese frogs and found that they were not serving their usefulness, in that the manganese portion is still good after the rest is ready for the scrap heap. The motion to refer back was carried.

Coming to guard rails, some members thought that the end bend recommended by the committee was too short and therefore too sharp; that it should be as long and easy as possible to minimize the jar of entrance for a train going through at speed. Also the report recommended a 2-in. flangeway, and explanation was asked. Mr. Knickerbocker, of the committee, said it was based on the M. C. B. standard for flange thickness, which had lately been increased. Mr. Camp stated that this increase was only about  $\frac{5}{16}$  in. at the top of the rail. Mr. Ewing said that the M. C. B. minimum distance between backs of flanges—4 ft. 5 in.—really fixed the location of the guard rail in order that the wheels would trail through the frog naturally. This gives the present flangeway of  $1\frac{3}{4}$  in. A motion to refer back was carried.

Conclusion 2, recommending glazed sewer pipe with bell ends for wet cuts, was also referred back. The remaining conclusions required no action by the convention.

*Water Service.*—Conclusions 1 to 4 inclusive were adopted practically without discussion. Likewise the section under "Relative Economy of Different Types of Softeners." Mr. Bremner (C. & B. & Q.) said that in some cases where they used soda ash at softening plants the pipes clogged up rapidly and the valves suffered, necessitating sometimes rebuilding and enlarging the plant. Mr. Shurtleff, Chairman of the committee, said it was due to an excess of the reagent, which was unnecessary; that while it was thought by some that an excess was required, he knew of a large number of plants where the best results were obtained by using only enough soda ash to precipitate the sulphates.

The three paragraphs following, entitled respectively "Reagents," "Foaming or Priming" and "Minimum Quantity of Solids in Solution to Justify Treatment," were approved without discussion. Concerning the final paragraph, on barium hydrate, Mr. Shurtleff said: "The Board of Direction requested the committee to investigate the barium hydrate question and to report whether it would be economical as a reagent in place of soda ash. The committee has deduced an equation which will show at what price barium hydrate would be equivalent to soda ash, and the adoption of this conclusion would carry with it that equation. Personally, I would hesitate a long time before using barium hydrate as a reagent. It is a poisonous substance. With almost constant watching, occasionally we get an excess of reagent in treating our waters. Our trainmen will use tank water for drinking purposes on some of our Western lines.



Records from Turneaure's Recording Extensometer.

locations, while others thought this length all right, but the  $16\frac{1}{2}$ -ft. length not required for the turnouts recommended by the committee; others, again, favored the latter recommendation. On motion, the matter was finally referred back to the committee with instructions to ascertain from members by letter ballot what they considered the most economical lengths.

Regarding switch stands, Mr. L. R. Clausen (C. & M. & St. P.) objected to the type recommended for several reasons. (1) That the indications given by the switchstand was a matter for the signaling committee rather than the track committee. (2) It cannot be applied to all switches, as in many places they come too close together. Also, it is impossible on account of clearances to apply it to two-track and four-track layouts at all points, making some other type necessary, giving an inconsistent system of indication. (3) It resembles semaphore indications, making its use objectionable in proximity to interlocking plants. The Reading and Pennsylvania railroads in their automatic block signal territory have either dispensed with switch stands or use extremely low pot signals. (4) In automatic block territory the presence of such a stand between block signals would cause a confusion of indications, presenting a clear indication, for example, to an engineman who was proceeding with caution as a result of the indication of the signal at the block entrance. The signaling committee intends presenting at the next convention its recommendations for switch stands and there would undoubtedly be conflict. On motion, the recommendation was re-

Even though they might not get enough to be deadly, I do not believe in the idea of introducing slow poisons into the systems of our trainmen. The operating officers have enough trouble with trainmen as it is, without adding this. Another point is that it has not been used in practice as yet, and in acting on the sulphates of lime and magnesia alone, the barium sulphate is so evenly divided that it will take hours to precipitate it, except in those cases where we have the carbonates in the water in the form of heavy flakes, and magnesium hydrate, which is mucilaginous and will carry it down. Still, there may be some of the fine stuff left, and that is poisonous. I am opposed to the barium hydrate treatment."

The paragraph was received as information.

In connection with this report the President announced that a communication had been received from J. L. Campbell, Engineer Maintenance of Way of the El Paso & Southwestern, concerning the electrical treatment of boiler water on his road. Because of its length the letter was not read. It reported the process as efficient for their waters at the points used, although there were some practical difficulties that affected its desirability.

**Masonry.**—The chairman of the committee stated that since the report had been printed, careful consideration had been given by the committee to the specifications for stone masonry and recommended certain revisions to make them more concise, without changing their intent. There was not time for the convention to take up the revised version in detail, and Mr. Berg therefore moved their adoption for publication in the Manual with a footnote to the effect that it was a revision of previously adopted specifications, subject to formal action and adoption at the next convention. The motion was carried.

#### The Work of the United States Forest Service on Timber Preservation.

Mr. C. G. Crawford, of the United States Forest Service, addressed the convention of the American Railway Engineering and Maintenance of Way Association at its Thursday afternoon session, telling what his department is doing toward the prolongation of the life of ties and other timbers. He said: "The railroads are very large users of timbers, their annual consumption of this class of material being very great. This consumption is made up, of course, of bridge timbers, ties and other kinds, but largely of tie timber. We have heard here a good deal of discussion on the future timber supply, and committees have based some of their recommendations on the timber supply and caused certain recommendations to be made because of the scarcity of the timber. Each year the supply is becoming less and prices are going up. It has been stated on the floor of this convention that the railroads need the very best ties that can be had. It seems there are at present not enough facts to warrant the adoption of concrete or steel ties, and the wooden tie, for a while at least, must largely serve the purpose of the railroads. Unless something is done to lengthen the life of the tie to get a greater service out of it than at present, the railroads will experience a great deal more difficulty than at present in securing enough ties for annual renewals. This question, it seems to me, is one of the most vital matters confronting the railroads to-day. As you all know, the tie fails through decay and mechanical abrasion. These two causes largely aid each other; that is, when the tie becomes cut by rail wear, that aids in its decay. It makes a place for the accumulation of water and moisture, and the lodgment of fungus spores, which bring about the best conditions for decay.

"The Forest Service is carrying on a large number of experiments to ascertain the very best method of handling and treating timbers for the various uses. We feel very strongly that the reason the various timber consumers are not employing methods which will give a long life to timbers, is because there is not sufficient data available from which to decide on the best method to adopt, and for that reason we are strenuously laboring to secure information which will aid the consumers of timber in this country to decide upon methods of preservation which will give a long length of service to different timbers. In these series of experiments one largely augments the other. The various elements which enter into timber treatment and timber handling are best demonstrated by actual use. Of course, a thorough knowledge of the technological characteristics of the timber and of the different species, helps to estimate approximate results, but the final determination of the results which count are those obtained from actual use. Therefore, we are laying a large number of experimental tracks. We are laying them wherever we can find an opportunity to lay them and wherever we can get the railroads to co-operate with us in this work. In these different experimental tracks, each of a mile or two in length, we are using ties of different species treated under various methods—methods which are receiving most attention to-day, and which are considered most important. Then we use various forms of tie plates and various forms of spikes—the conditions which bring about the destruction of the ties and the ones which bear on the results which are necessary to solve these different problems. We are getting results on these timbers long before one would expect to get results. We are

asked if it will not take 10 or 25 years before we will know anything about these results. I want to say that it is not necessary to wait so long. It is surprising, when you make a careful survey of the tracks, how quickly you get results in some form or another. The ties do not begin to decay in two or three years, but we know the conditions which bring about decay. We observe the checks in the ties, dampness or fungus spores, and we can often tell by the appearance of a tie how long it will last, and we are in a better position to estimate the length of the life of the tie. We consider the experimental tracks are of prime importance in solving the problems which are going to confront the railroads and other users of timber in a short time, which will make it imperative for them to adopt some systems other than the ones now in use to get greater length of life out of the tie.

"This experiment is being supplemented by others, and there is one in particular which I wish to mention, one in which we are carrying on experiments on timbers, not in the form of ties, but mine timbers. The experiments are being carried on largely in the anthracite mining regions of Pennsylvania. We have conditions of a regular rotting pit, where we can get results quickly. Large timbers, 13 in. in diameter, are destroyed by decay in so short a time as eight months. We are applying different preservatives to these timbers, and preservatives in different quantities, so as to ascertain what preservatives are the best and how much of the preservative is necessary to secure the best results. We are working on the question, too, of the character of the preservatives and the different constituents of the preservatives which are most essential to preserve the timber, and right in these mines we have the best conditions we could possibly wish for to prove out and demonstrate the value of these constituents."

#### Location Surveys for the Eastern Half of the Grand Trunk Pacific.

The eastern section of the Grand Trunk Pacific, from Moncton, N. B., west to Winnipeg, Man., often called the National Transcontinental Railway, is being built by the government of Canada through the National Transcontinental Railway Commission, of which H. D. Lumsden is Chief Engineer. In a recent address as retiring President of the Canadian Society of Civil Engineers, Mr. Lumsden gave the following account of the surveys for the new line:

The assumed distance between Moncton and Winnipeg was 1,890 miles, which was divided into six districts, averaging about 315 miles each. A district engineer was appointed to each district as the work progressed, and control of the survey parties in each was directly under the district engineer. District A, New Brunswick; District B, Eastern Quebec, and the prairie or westerly portion, or about 65 miles of District F, being comparatively easily accessible, the parties on preliminary surveys consisted of an engineer-in-charge, transitman, leveller, topographer, two rodmen, two chainmen, picketman, five axemen and a cook. When location was begun these parties were supplemented by the addition of a draftsman and one or two axemen.

The country from the St. Maurice river westerly to within about 100 miles of Winnipeg, on the route laid down to be explored, was one of which little was known outside of explorations made by the Geological Survey up various streams, which almost all ran at right angles to the general course of our line, and one or two survey lines in Northern Ontario and Manitoba. The survey parties employed in the unknown districts were considerably larger, having in addition five or eight men as axemen and packers, who were continuously employed in bringing in to their parties provisions from the nearest caches or depots. Previous to our beginning work the Grand Trunk Pacific had put a number of parties in the field between Winnipeg and North Bay, and made a preliminary survey of a greater portion of the route, and in the winter of 1904-05 we took over from them all the plans, profiles and information they had obtained of that portion of the country, and made use of them where practicable, also taking over what provisions they had on hand in that district. During the winter of 1904-05 we had in all 11 parties making preliminary surveys in New Brunswick, 11 parties between New Brunswick and the Quebec boundary and Weymontachene on the St. Maurice river, or Clear Lake, eight parties between the last mentioned points and the boundary between Ontario and Quebec and two parties, one south and one north of Lake Abitibi. In January, 1905, one preliminary and five exploration parties were sent out in District F, between the northwest angle of Lake Nepigon and the Manitoba boundary, to make a thorough examination of the country, with a view of shortening and improving the line previously run by the Grand Trunk Pacific.

At the end of March, 1905, we had 38 parties, and by the middle of the summer, 45 parties in the field, of which about one-half were in inaccessible districts, necessitating the transport of supplies for their maintenance for distances up to 200 miles from the nearest available transport routes. Owing to the heavy snow and lack of much knowledge of the possible routes to reach the various parties, great difficulty was experienced during the first

winter in keeping parties fully supplied, but since then, by better knowledge of the country and the cutting of a few winter roads to the principal distributing points or depots, and pack trails thence to caches on or near our line, or to points to which transport by water in the summer is good, we have now little trouble, and not one-third the expense in keeping parties fully supplied, and maintaining at least a bi-monthly communication with all of them.

Printed books of instructions to engineers were issued early in 1905, in which were set out the duties of various classes of engineers, transmitters, levellers, topographers, field draftsmen, etc., and giving general instructions as to the plotting of plans, profiles, etc. They also contained memoranda of necessary camp outfit and supplies, medicine chests, stationery boxes, etc., for 18 men for 200 days. These were modified according to the circumstances under which parties were working. Supplementary instructions were also issued from time to time in regard to the engagement and paying off of men, the making up of pay-rolls, expense accounts, the precautions necessary to prevent forest fires, and copies of the regulations in force in each province for that purpose, also instructions and precautions to be taken by men in charge of canoes.

During the summer the numerous waterways were the only routes available, and with the exception of a few pointers or lumbermen's boats, canoes were the only means of transport. This necessitated a large amount of manual labor, packing outfits and provisions over the numerous portages, varying in length from a few yards to several miles. Great difficulty was found in procuring a sufficient number of men suitable for this service, as only those who had previous experience in this sort of work were at first of much use for the arduous labors of packing. Numbers of men, thinking because they had been frequently in canoes they were quite competent to take part in such work, soon found that canoeing for pleasure was a different matter from this, and that the carrying of numerous loads of 100 lbs. or more, on their backs, over even a portage a quarter of a mile long, was more than they could stand, while men such as half-breeds and Indians, who had been brought up to such work, would with ease carry double the load the novice could do, and keep at it all day. The principal canoes used for this purpose were made of basswood, but a few cedar and canvas canoes were also used. They varied in length from 16 ft., which were used for light work and carrying mail, to 22 ft., the latter being of extra beam and depth, and capable of carrying over a ton of provisions, together with the necessary crew. During the summer of 1905 we were exceptionally unfortunate, and the accidents to parties in canoes were numerous, causing the loss of a number of valuable lives.

Our experience has been that by far the most economical means of transport, outside of rail or steamer, is by horses and sleighs where practicable, and the cutting of a few miles of winter road connecting or following large bodies of water, has been the means of saving thousands of dollars. The provisions also were delivered in much better condition, rainy or hot weather, leaky canoes and carelessness of men contributing largely to the depreciation of the value of many kinds of goods while in transit by canoes. The distribution by teams beyond certain distances was found to be impracticable, owing to the fact that either all fodder had to be brought in at great expense, or no lakes and streams were available, and the amount of provisions required was not sufficient to warrant the cutting of sleigh roads for the whole distance.

To overcome this difficulty we have been making use of a number of men, dogs and toboggans with very satisfactory results, distributing from our main caches, or stores, to smaller ones in the vicinity of our line, say 10 or 20 miles apart. Few people who have never had the actual experience with the use of dogs as a means of transport can form any idea of their capabilities, and the ease with which they seem to do their work, provided the men in charge take proper care of them and see that they are regularly fed and sheltered on cold or stormy nights. A team of dogs may consist of any number from two to six, or even more, but in a rough timbered country from three to five is the most one man can conveniently handle. The dogs used by us were all, with a few exceptions, bought in the towns and villages, and as long as they were of sufficient size, and not too young or too old, they were acceptable. Few days are required to break in a team of dogs, especially if one broken dog can be found for a leader. A man and five dogs will, in a moderately rough timbered country, move 500 lbs. six to eight miles a day and return for another load. In a level country, with a good trail, they can make 10 to 12 miles a day and return. Where lakes and rivers are available, and there is good going, 30 to 50 miles a day have been frequently covered by dogs with a light load. For freighting purposes every dog's load can be considered as 100 lbs. The drivers of dogs should be active, hardy and of good temper. All that is necessary for a dog trail is that several men go over it with snowshoes, cutting out all brush and logs for a width of say 2 ft., avoiding as far as possible all sharp turns or steep hills. The more such a trail is traveled over the better it becomes, especially where in a timbered country it is protected from drifting snow. The toboggans used are about 8 ft.

long and 14 in. wide, preferably made from split-out strips of birch, maple or ash  $\frac{1}{2}$  in. thick. Each toboggan is provided with a canvas cover, in which all goods are securely covered and lashed to the toboggan with cod-line, or light rope, a light rope being also attached to the rear end of the toboggan for the driver to hold on to, and enable him to hold back when going down hill. Regular leather harness is provided for dogs, the only precaution necessary being to see that the collars fit each individual dog and do not gall the shoulders or neck.

Having personally had considerable experience in railroad location, I may say that in my opinion when surveys are to be conducted in a country which is timbered and little known, it is in the long run a great saving in time and money if it is practicable to have the engineer who is to have charge of the survey, accompanied by a good assistant and say half a dozen or more men, go over the country as best he can, running rough compass lines, using a micrometer, pacing or estimating for distances, taking barometrical altitudes, and generally becoming acquainted with the nature of the country and the principal difficulties he may expect to have to overcome. Having gone over the whole of the section allotted to him, and thoroughly explored the country for several miles on either side of his rough compass line, he will have naturally formed some idea of the best route to be followed, and save the cost of a large party running instrumental lines that may prove after weeks of hard labor utterly impracticable through running into some unforeseen obstacle.

The engineer in charge of work of this character should be one who has had considerable experience in a timbered country, able to find his way anywhere and not afraid of being lost. He should be able to establish his latitude and approximate longitude by observation, though owing to the difficulty in carrying a reliable chronometer the latter is seldom to be relied upon. On reaching his point of departure, his aneroid barometers, of which he should have at least two, or better, four, having all been previously compared and rated, he will assume a datum for elevation for his work, and all altitudes should be reduced to that datum. By arranging the movements of his party he can provide that one barometer will always be stationary, and if a half-hourly record of its readings is carefully kept all altitudes taken by the party in the field can be reduced to one datum, the party having kept record of the time at which the observations were made. As it is well known, such barometrical altitudes cannot be explicitly relied upon, but with care and good barometers it is surprising what close approximation to the true altitudes can be obtained. My experience has been that the aneroid barometers best suited for rough work are those about  $2\frac{1}{2}$  in. in diameter, divided to read 5 ft. The range of such barometer does not generally exceed 2,800 ft., but they are much less liable to get out of order than the larger ones, which are supposed to read by verniers to one foot.

Having thoroughly explored the country through which he is to operate, the engineer in charge selects a route for his preliminary line, and having been joined by his transitman and the rest of his party, he proceeds with the running of such a line. If the country is rough and broken a transit should be used, but if tolerably level a picket line, run by the aid of field glasses, the angles being turned with a transit or box sextant, is generally the faster method, and sufficiently accurate for preliminary purposes if the line is checked by compass bearings. The chainage should be done with a light steel chain. Having assumed a datum for elevation, the leveling should in all cases be carefully done and checked wherever practicable, bench marks being established at least every half mile. Cross-sections should be taken by the topographer as frequently as the nature of the country may require, to enable him to show contour lines for every 5 ft. of elevation on either side of the line for considerable distances. As the through levels are not in any way affected by the cross-section work, these sections can be taken with sufficient accuracy with a good hand level, the distances, right or left being measured with a chain or tape. It is a good practice to insist that the field notes of all instrument men be plotted up by the men who made them each night as the work progresses; this will save time and avoid many errors.

Having completed his preliminary line the engineer in charge lays down on his plan, with the aid of contour lines, a proposed location and proceeds to stake it on the ground, the levels being checked with those of the preliminary line, and bench marks established every 1,000 ft. Having completed his first location and made any revisions that may have occurred to him, the engineer who has been in charge of such work should be moved on to other work and a new man put in charge for final location. This new man should, before taking charge of the party, be furnished with the plans and the profiles, and given ample time to go over the lines run by his predecessor. He may or may not be able to improve on the previous line, but in any case the judgment of two in place of one is obtained on final location.

The commissariat for a survey party to-day is a very different matter from what it was 30 years ago. Formerly, if a party was well supplied with bacon, beans, flour, tea and sugar, it was all

that they expected, whereas to-day the addition of canned meats, dried fruits, vegetables and canned goods generally, has added much to the variety of food supplied; but the one thing that in the old days contributed more than others to the well-being and comfort of a party is still the same, namely, a good cook.

#### The Orenburg & Tashkend Railroad.

The Orenburg & Tashkend Railroad, opened for traffic throughout its full length of 1,150 miles April 1, 1906, has had its traffic reported for each month down to August last. The line extends from Orenburg, which is in Russia near the southern end of the Ural mountains, southeast through a semi-arid grazing country, the bottom of an old sea, to the fertile Central Asian territory. This country produces cotton and fine fruits. The 1,151 miles of this railroad are worked in connection with 235 miles of an older railroad to Orenburg, connecting with European Russia. Its gross earnings were \$365,844 in August, 1906, and 40 per cent. more than in 1905, when it was not yet opened through to Tashkend. This is at the rate of \$264 per mile for the month. The wool, camel's hair, hides and other products of the vast herds and

flocks of the plains have increased greatly in value in consequence of this new outlet to market, which seems likely to divert nearly all the traffic of the fertile country in the Tashkend country from the Asiatic Midland Railroad to the Caspian, heretofore its only outlet. There is good coal on the line, and immense deposits of salt, copper and silver mines too poor to be worked when there was no railroad, and some petroleum. Already it is proposed to build several branches, some of considerable length.

#### The Flatbush Avenue Terminal of the Long Island Railroad.

BY CHESTER A. CRANDELL.

The new Flatbush avenue terminal in Brooklyn is the common terminus of two distinct subways. It is entered on the Atlantic avenue side by the Atlantic Avenue Improvement subway of the Long Island Railroad. The Brooklyn subway, which connects with the subway system of Manhattan by means of the East river tunnels, enters from beneath Flatbush avenue.

At present the only connection between the two subways is a passenger subway shown in Figs. 1 and 2, which is below the level of the tracks and leads up to the platforms of both stations by

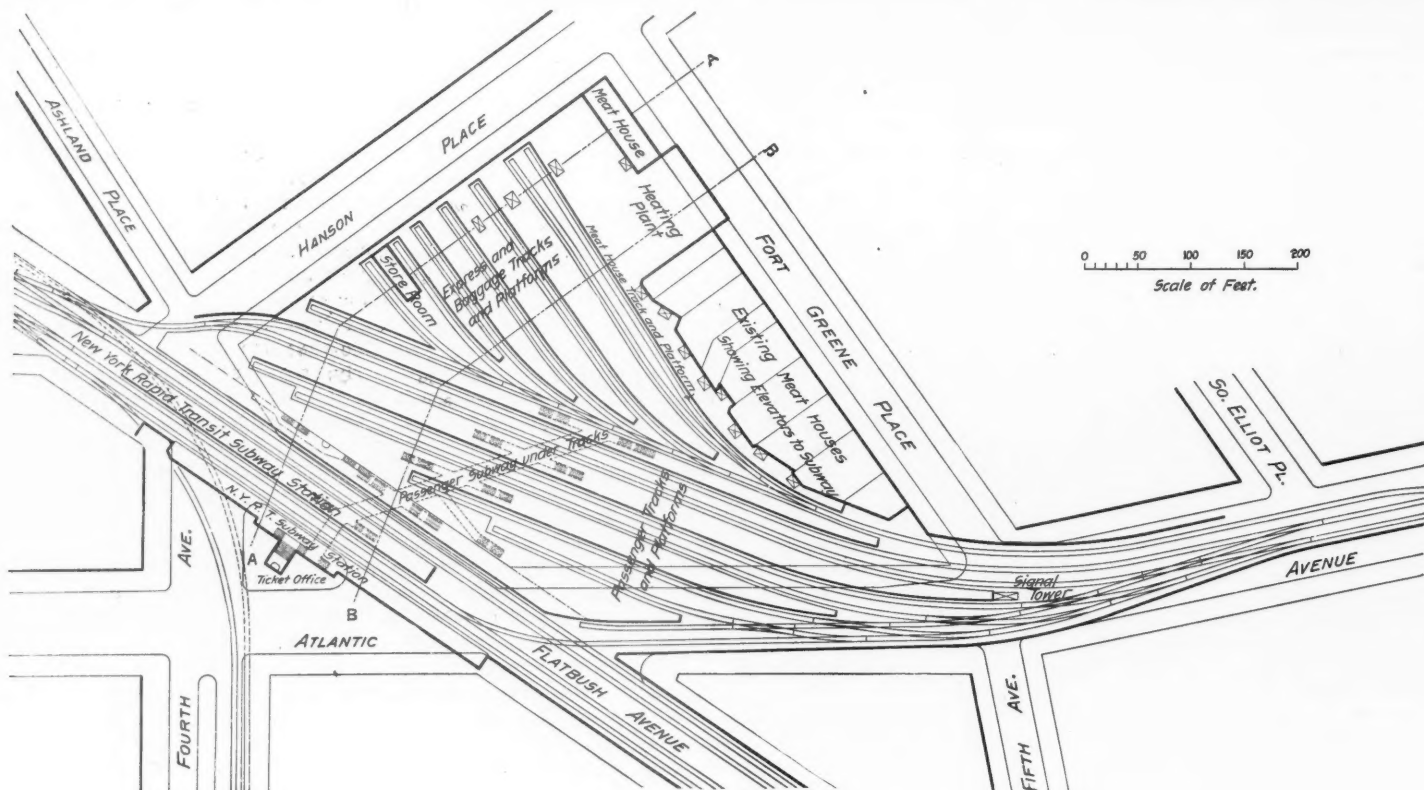


Fig. 1—General Plan, Flatbush Avenue Terminal.

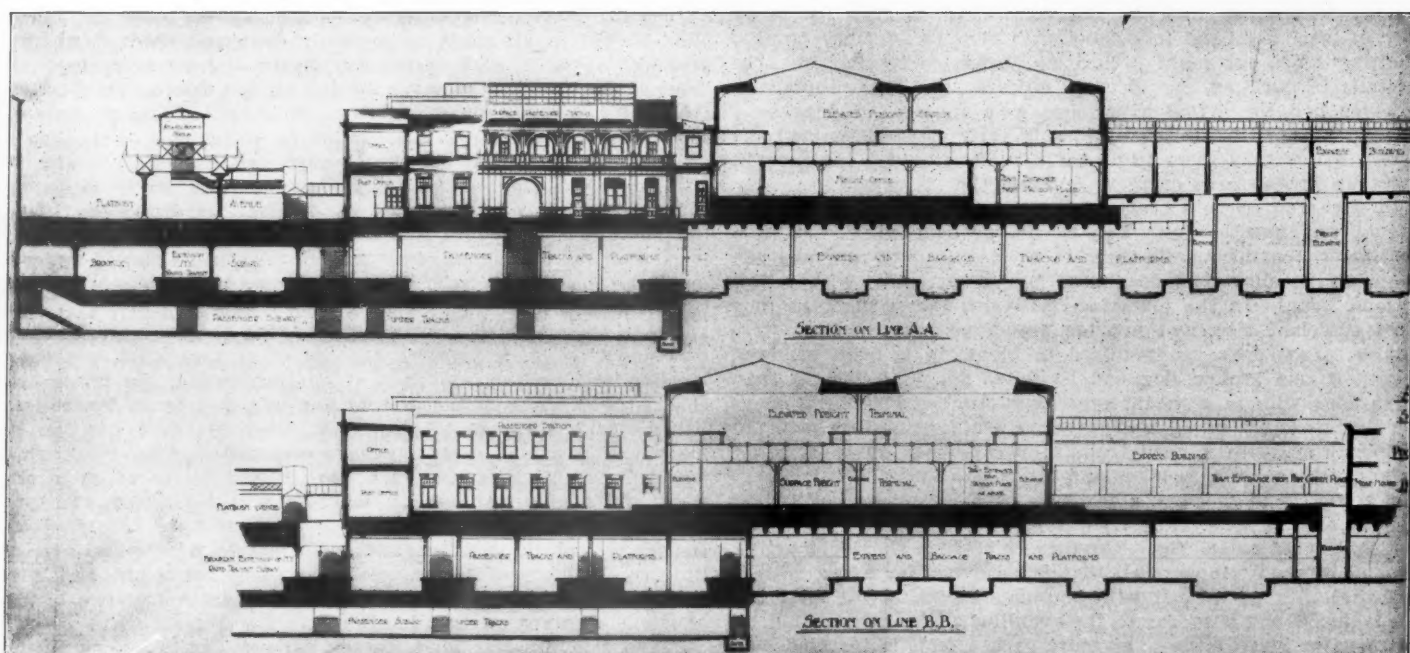


Fig. 2—Section Through Flatbush Avenue Subway Terminal.



Fig. 3—Grillage, Looking North.



Fig. 4—Express Platforms.

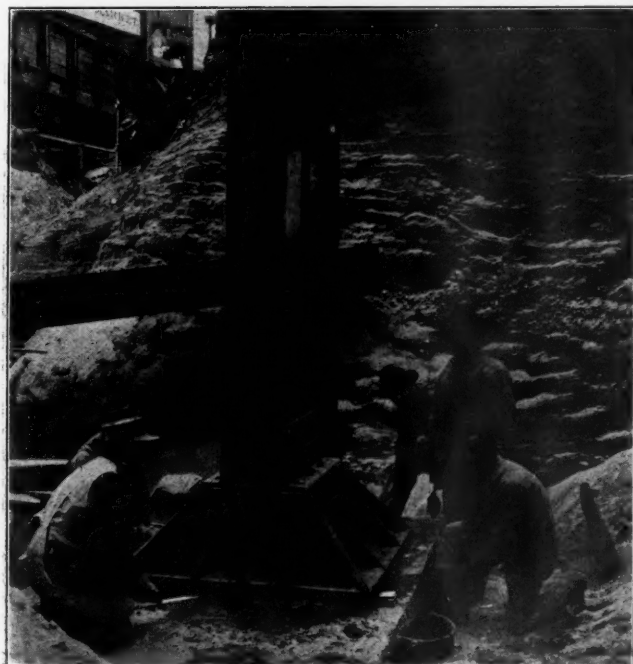


Fig. 5—Ramming Method of Grouting Columns.

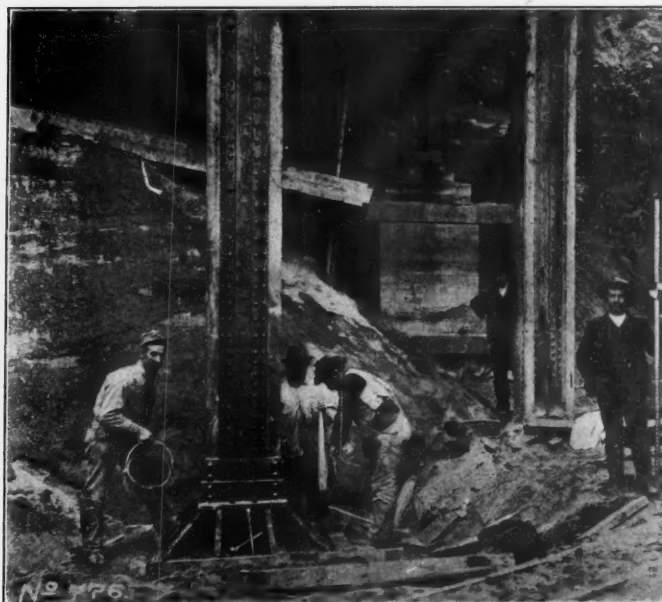


Fig. 6—Pouring Method of Grouting Columns.

means of stairways. Provision is being made, however, in the construction to permit of two single-track connections at some future time should occasion demand. These proposed tracks appear in Fig. 1.

In a general way, as will be seen from the sections in Fig. 2, the terminal consists of three levels. The lowest of the three is for the railroad subways and the train platforms. The connecting passenger subway before-mentioned, alone is below this level.

The second, or street level, is entirely clear of tracks, and is devoted to the main floor of the Long Island Railroad station, driveways, etc. Station L of the Brooklyn postoffice occupies a wing of the station building.

The freight tracks of the Long Island Railroad are brought into the terminal at the third level on an elevated structure. This structure is connected with the Atlantic avenue subway by an incline between Carlton avenue and Sixth avenue, five blocks east of the terminal.

The station building proper and the post-office station are built of terra cotta brick. This is almost the only part of the work where bricks are used. The granolithic station floor is founded on a cinder

base, spread over the roof of the terminal, while the walls are supported by steel grillage, shown in Fig. 3, bearing on the main columns of the terminal below. Fig. 4 shows the general type of construction, which, as will be seen, was arranged to conform to the arbitrary column locations as determined by the track layout. Perhaps the most distinctive feature of this undertaking is the lack of difficulties attending it. Indeed, its progress has been so fortunate that at the time when sand and stone were needed for the composition of the concrete retaining walls, platforms, etc., a sand bed was struck in the course of the excavation; and sufficient rock had been previously blasted to supply the crusher. Another evidence of this feature was the character of foundation at the rear of the "existing meat houses," as shown in Fig. 1. The ground was such that, by the introduction of mud sills, each building could be supported while a trench was dug and a concrete wall built from the low level of the terminal to the old footing of the building.

After the excavation had been completed and the retaining walls built, the steel work was begun simultaneously at two points. From the boundary line at the end of the Atlantic Avenue Improvement, the erection was carried west, while from a line near the middle of the passenger section it was carried both east and west.

Figs. 5 and 6 show the two methods of grouting columns, viz., ramming and pouring, which gave equal satisfaction. As may be inferred from these pictures, the columns were temporarily suspended from the girders above by bolts and then plumbed. After grouting, the steel work was riveted, and the work proceeded very smoothly.

As a result of this facility, there has been little or no demand

for novelty of method. With perhaps the exception of the method used in temporarily supporting the elevated structures, there is nothing very new to the engineer.

Fig. 7 shows quite clearly the provision made for carrying the elevated railroads and their traffic while the columns were undermined to erect the permanent foundation. Advantage was taken of the exposed rivet heads on the columns, and timbers were set up beside them and held with clamps which were tightened as the timbers were driven solid against the columns. The rivet heads, being imbedded in the wood, afforded, in total, adequate bearing surface to support the structure, leaving the base of the column exposed.

A few leading figures may serve to give a more definite impression of the extent of the work on the terminal. They are as follows:

Excavation .....	170,000 cu. yds.
Concrete .....	20,000 "
Granolithic pavement .....	80,000 sq. ft.
Steel .....	3,700 tons.

The excavating and the steel and concrete work are being done by the Degnan Contracting Company. The passenger station was built by the P. J. Carlin Construction Company of New York. The Hedden Construction Company of New York has the contract

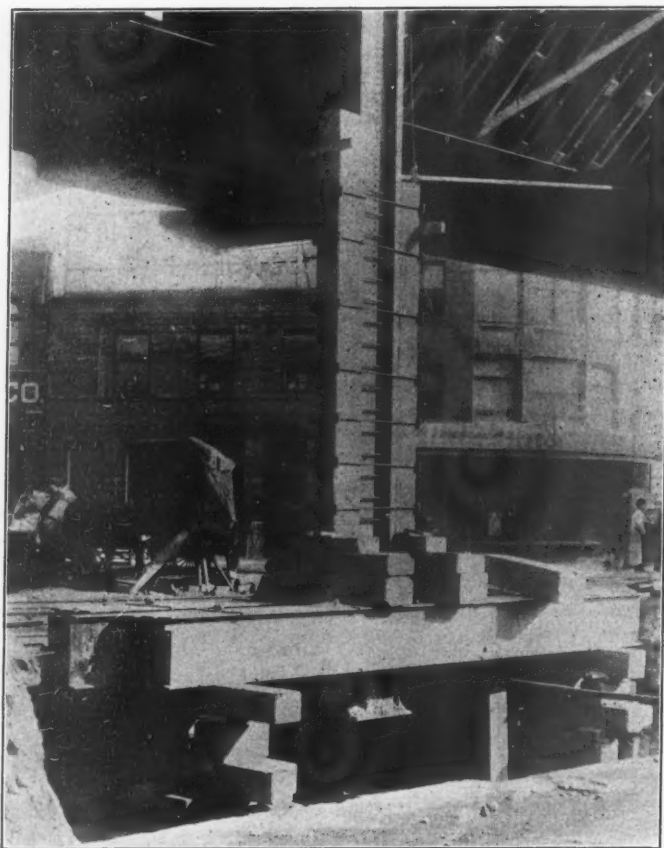


Fig. 7—Method of Underpinning Columns.

for the express office, while the corrugated iron express shed was built by the Long Island Railroad.


For the photographs and information of this work we are indebted to Mr. Ralph Peters, President of the Long Island Railroad; Mr. Lawrence J. Carmalt, Principal Assistant Engineer, and Mr. Charles H. Berry, Resident Engineer of the Atlantic Avenue Improvement.

#### The Oldest Railroad Junction in the World.

BY W. B. PALEY.

In the *Railroad Gazette* of August 23, 1901, mention was made of the centenary of the first British public railway act, which occurred on May 21 of that year. The line was described as a horse tram-road, solely for general merchandise traffic, termed the Surrey Iron Railway. It possessed a short branch, only about 1½ miles in length, from a point on Mitcham Common to certain mills at Carshalton. The exact spot where this branch diverged from the main line is still quite visible, about 150 yards west from the platform of Mitcham Junction station on the London, Brighton & South Coast Railway. The site of the tram-road junction now forms part of the Brighton Company's Croydon & Wimbledon branch, which for a little way on each side of it occupies the old course of the tram-road. So far as can be ascertained, the place may certainly be considered the site of the oldest railroad junction in the world. It has not, however, even when reckoning

the present Mitcham junction as virtually its successor, been in use continuously as such ever since the Surrey Iron Railway opened in 1803, for on August 31, 1846, that line was finally closed for traffic and completely dismantled soon after. From then until the Croydon & Wimbledon line was opened, on October 22, 1855, there was no railroad near the place, nor any junction again till October 1, 1868, when the Brighton Company opened a line from Peckham Rye to Sutton. This passes under another bridge, and is of course, now in active use; it unites with the Wimbledon line at the west end of Mitcham Junction station and runs off at the east end, forming part of the London & Portsmouth route.

No sign of the permanent way of the tram road remains in its original position, but two or three of the small stone blocks that carried the  plates may be seen here and there, utilized as boundary marks at corners, and so on. The course of this branch curves away with a bold sweep from the junction to the south, and can be well viewed from the bridge. A public right-of-way along it, still called Tramway Path, is no doubt a survival from the time when people used to walk freely along the tram-road. Evidently it was a double line for a little way, like the main line, but was probably not so throughout. The site of the branch is soon lost in the back yards of the houses of Tramway Terrace, behind which the path runs, but it comes to light again at the Goat Inn at Beddington Corner and forms the raised footpath by the road side, marked by posts and rails. Whether the branch was completed when the rest of the Surrey Iron Railway was opened on July 26, 1803, is not known to the writer, but a most interesting "toll-sheet," or list of rates, in the South Kensington Museum, proves that it was in use by June, 1804, at any rate.

At Carshalton the branch ended at the oil mills of Mr. Shepley, but these have long disappeared and a tan yard takes their place. The line approached the mills along the east bank of the River Wandle, in the line of the private road now leading to the tan yard. Between Beddington Corner and this point the line ran across Hackbridge Green, which has since been enclosed, but a curved row of trees still marks the course the tram road took. One or two old maps appear to show a sub-branch from near the Goat Inn to certain other works a little lower down the Wandle, but while probable enough the writer has been unable to confirm their testimony.

The country about here is very pretty in summer and well worth a visit from anyone who appreciates the part these humble old horse trams played in leading up to their great successors, the steam railroads of to-day.

#### Grover Cleveland on Attacks Against the Railroads.

The following is from an interview with ex-President Grover Cleveland published in the *New York Times* of March 24th:

There is much of the nature of delirium in the popular outcry against railroad corporations, for instance. We shall all be ashamed of it by and by. I dare say I have some reason to know of the real iniquities of corporations, and I do know them, but there is much that is not only groundless, but wrong, in the offhand attacks made on the railroads by thoughtless people on all sides. What is well founded in them will be cured, but the craze of denunciation will soon pass. We shall reflect that railroads are vitally related to our prosperity, and that to attack them needlessly is to attack ourselves. It is not the stock of soulless millionaires, but the property of citizens, of widows and orphans, whose savings are invested in railroads, that is being damaged. We shall recall what railroads have been and are still to be in the development of our country, and this craze will pass.

Of course there must be some form of governmental supervision, but it should be planned in a quiet hour, not in one of angry excitement.

Popular emotions follow peculiar laws. The psychology of a craze is most interesting. The temptation is well-nigh irresistible to do what we observe our neighbors do. If they begin to throw stones, we hunt for missiles ourselves. The railroads have had a hard time lately. Every man's hand is against them. Wherever a railroad head is to be seen it is safe and amusing to hit it; its owner has no friends. There are some pretty big difficulties before railroad managers just now. Before long we shall have a crop to move, under perplexities greater than those of last year. And the increasing production of the country will increasingly embarrass the railroads. But I have faith to believe that whenever a thing must be done Yankee wit and pluck will find a way to do it—especially if there is any profit in it.

Only we should help and not hinder. I have observed those passionate outbursts during a life of threescore years and ten. I trust I have a fitting appreciation of the justice which lies beneath the present popular clamor against corporations, and especially railroad corporations, but I believe that as a frenzy it will pass, and that the people will demand of the party to which they give their suffrages the enunciation of a principle rather than the denunciation of a condition.

Doubtless the questions which the press keeps so persistently

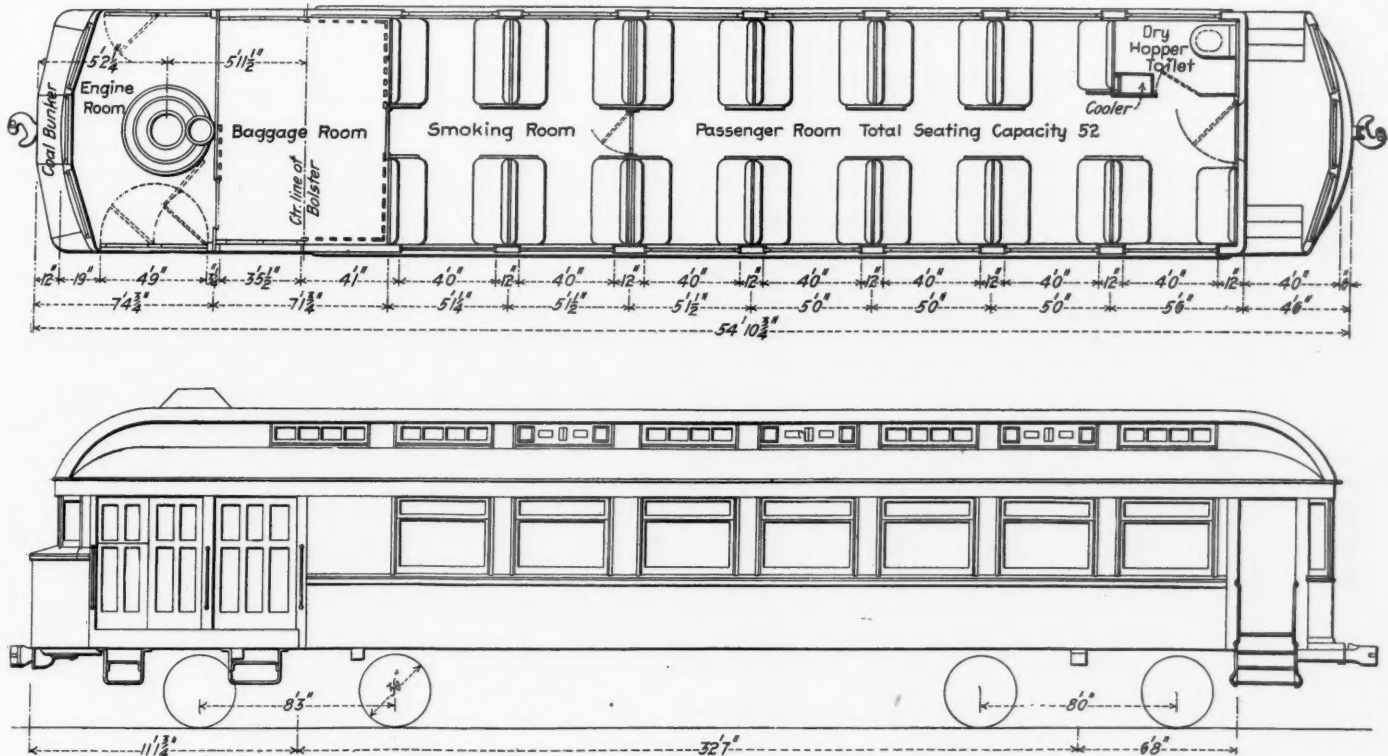
before the public attention and in which there is indeed keen public interest are urgent and important. They must be met and solved. They will be solved by common sense and justice. I am no friend of corporations. I am afraid I should wipe out the possibility of the existence of the evil ones, but I see in the question as to whether railroad fares should be 3 cents or 2 cents a mile no great principle.

#### Ganz Steam Motor Car for the Rock Island.

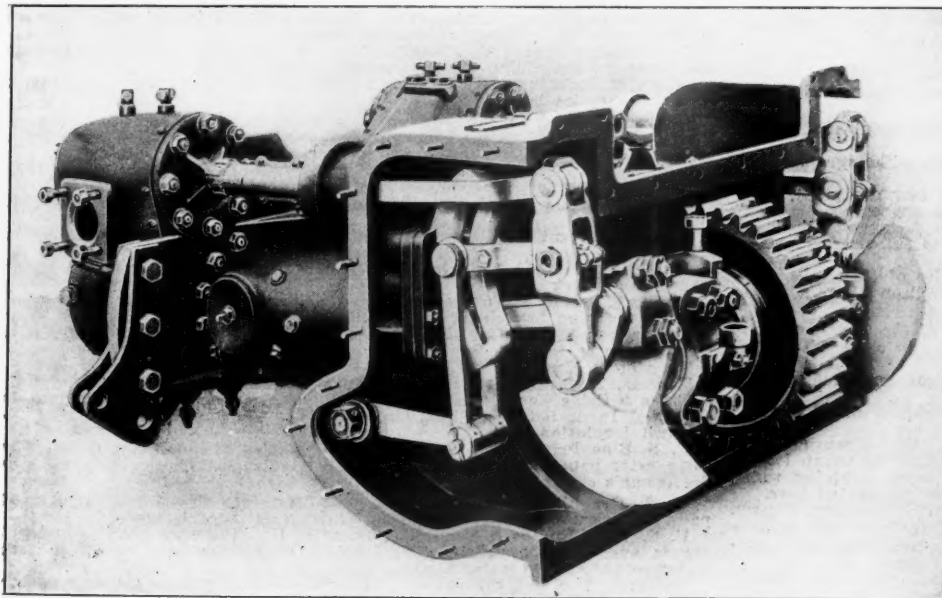
The Chicago, Rock Island & Pacific is soon to receive a Ganz steam motor car from the Railway Auto Car Company, New York, the company which controls the patents and manufacturing rights for the Ganz system in the United States. The general plan and

tanks have a total capacity of 600 gallons, or sufficient for a continuous run of about 60 miles. The steam generator is of the standard Ganz type, and is 42 in. in outside diameter. This steam generator is capable of developing a maximum of 120 h.p. in conjunction with the compound steam motor, which is mounted in the forward truck and which drives on the rear axle thereof.

The second illustration shows a view of the steam motor with the cover enclosing the gears and link motion removed. This motor is compound and steam jacketed, and is entirely enclosed. The gear case is partly filled with oil so that all moving parts receive a continuous and thorough lubrication. The normal speed of this motor is 600 revolutions per minute, although it can be operated satisfactorily up to a speed of 900 revolutions per minute. The working pressure is 270 lbs. per sq. in., and the steam is superheated. The



Ganz Steam Motor Car for the Chicago, Rock Island & Pacific.



Motor of Ganz Car with Crank Case Removed.

a side elevation of this car are shown herewith. The total length over end sills is 54 ft. 10 3/4 in., and the car has seats for 52 passengers, including 16 in the smoking compartment. The baggage room is 7 ft. 1 3/4 in. long, and the motorman's compartment at the forward end of the car, which contains the generator and accessories, is but 6 ft. 4 3/4 in. long over all. The coal bunker is supported over the front end sill, and the coal is removed through a small sliding door opening into the motorman's compartment. The coal bunkers carry sufficient fuel for a continuous run of 50 miles.

The feed water for the steam generator is carried in two longitudinal steel tanks suspended from the underframe of the car. These

motor is controlled from levers conveniently located at the right hand side of the motorman's compartment.

The car body is of all-steel construction, with the interior finished in quartered oak. The design of the car body is in accordance with what is now considered to be the most advanced practice in passenger car design. That is to say, the vertical load is taken care of by the sides of the car, which form deep girders, while the buffing strains are taken care of by relatively light longitudinal center sills. The total weight of this car in working order, fully loaded, is 36 tons. The car is equipped with Westinghouse automatic brakes with an air compressor of the axle-driven type mounted on the trailer truck.

The car is designed to maintain a speed of 35 miles an hour on a level track, 24 miles an hour on a 1 per cent. grade, and 15 miles an hour on a 1 1/2 per cent. grade. The car is also capable of hauling a trailer at a speed of 30 miles per hour on a level track, and 15 miles an hour on a 1 per cent. grade. The fuel is to be coke, and the consumption is not to exceed 16 1/2 lbs. per mile.

This is the first standard car of the Railway Auto Car Company which will be built and delivered in this country, although other cars of this general type are now being built.

The Society of Italian Chambers of Commerce has issued a circular complaining of the bad condition of railroad traffic, in which it cites as instances three shipments of freight from Milan to a station 3 3/4 miles distant. One of these shipments arrived 44 days, the second 45 days after delivery to the railroad, and the third had been shipped more than a month previously, and nothing further was known of it.

## Exhibits at the Maintenance of Way Convention.

The number of exhibits was about the same as last year—a little greater possibly—and it was again evident that the space available for their display at the Auditorium is entirely inadequate. It is understood that some definite action will be taken during the coming year toward procuring suitable quarters elsewhere for exhibit space for future conventions. It is to be hoped that this will be done. The list of exhibitors follows:

- Adams & Westlake Co., Chicago.—Samples of "Adlake" signal lanterns.  
 Ainsworth & Sons, Wm., Denver, Colo.—Samples of Brunton pocket transits, Ainsworth precision transits, and engineering instruments.  
 Allith Manufacturing Co., Chicago.—Full-sized door, showing application and operation of Allith adjustable door hanger.  
 American Flange Frog & Railway Improvement Co., Roanoke, Va.—Model of Graham flange frog.  
 American Guard Rail Fastener Co., Philadelphia.—Samples Anchor guard rail clamp.  
 American Hoist & Derrick Co., St. Paul.—Photographs of "American" railroad ditchers.  
 American Railway Device Co., Chicago.—Model of "Economy" separable switch point.  
 American Steel & Wire Co., Chicago.—Samples of steel wire fence.  
 American Tracing Cloth Co., Paterson, N. J.—Samples of "Peerless" tracing cloth.  
 American Valve & Meter Co., Cincinnati, Ohio.—Full-sized samples of "Economy" switch stands and model of track and switch showing operation of Anderson interlocking switch stand.  
 Atlantic Equipment Co., New York.—Photographs of "Atlantic" steam shovels and contractors' saddle-tank locomotives.  
 Atlas Railway Supply Co., Chicago.—Atlas rail joints, braces and tie-plates, including the Atlas insulated and compromise joint.  
 Barrett Manufacturing Co., New York.—Samples of Barrett roofing materials.  
 Beaver Dam Malleable Iron Co., Beaver Dam, Wis.—Samples of malleable iron tie-plates and rail braces; also F. & N. anti-spreader and anti-creeper.  
 Belle City Malleable Iron Co., Racine, Wis.—Samples of L. & S. anti-rail-creeper; L. & S. adjustable rail brace; L. & S. stationary rail brace; also model of track, showing effect of application of L. & S. anti-rail-creeper.  
 F. W. Bird & Son, East Walpole, Mass.—"Paroid" roofing, "Hydrex" waterproofing and "Neponset" insulating paper.  
 S. F. Bowser & Co., Ft. Wayne, Ind.—Full-sized samples of Bowser self-measuring oil tanks.  
 Brinker Safety Switch Attachment Co., West Lebanon, Ind.—Model of safety switch.  
 Wm. Brown Paint Co., Chicago.—Samples of painted materials.  
 Browning Engineering Co., Cleveland, Ohio.—Card showing Browning locomotive coaling cranes.  
 Bryant Zinc Co., Chicago.—Samples of crossing bells, batteries, relays, etc.  
 Buda Foundry & Manufacturing Co., Chicago.—Paulus, Buda and Wilson track drills, switch stands, rail benders, car replacers, ratchet and friction jacks, etc.  
 Cambria Steel Co., Johnstown, Pa.—Sample 100 per cent. rail joint and 100 per cent. insulated rail joint.  
 Carnegie Steel Co., Pittsburgh.—Sample of Duquesne splice bar and steel cross tie; also samples of built-up steel tie after six years and ten months' service in main track of Lake Shore & Michigan Southern Ry.  
 Central Iron & Steel Co., Harrisburg, Pa.—Samples of "American" steel cross tie.  
 Chacamas Plantation Co., Chicago.—Samples of timber ties.  
 Chameleon Signal & Manufacturing Co., Edwardsville, Ill.—Full-size sample of "Chameleon" automatic block signal.  
 Chicago Pneumatic Tool Co., Chicago.—Samples of riveting and chipping hammers, drilling, reaming and boring machines; also sand rammer.  
 Chicago Steel Tape Co., Chicago.—Measuring tapes and jointed leveling rods.  
 Cleveland Frog & Crossing Co., Cleveland, Ohio.—Samples of "Prentice" anti-rail-creeper.  
 Climax Stock Guard Co., Chicago.—Samples and model showing "Climax" shale clay stock guard; also models of "Climax" and "Eureka" gates.  
 Conley Frog & Switch Co., Memphis, Tenn.—Wooden model of Conley frog.  
 Cook's Standard Tool Co., Kalamazoo, Mich.—Full-size samples of Cook's collapsible rail drill and drill grinders; also standard track jacks and Cook's combination steel and wood cattle guard.  
 Cortright Metal Roofing Co., Philadelphia.—Samples of metal roofing and model showing application.  
 Detroit Graphite Manufacturing Co., Detroit, Mich.—Photographs and pamphlets describing suspension graphite paints.  
 Danville Car Co., Danville, Ill.—Photograph showing new car plant.  
 Dickey, G. W., Chicago.—Model of "Dickey" rail joint supports.  
 Paul Dickinson, Chicago.—Dickinson movable smoke jack and Dickinson ventilator; full-size section of 40-in. cast-iron jacks; also full-size samples of Dickinson cast-iron chimneys and ventilators.  
 Dilworth, Porter & Co. (Ltd.), Pittsburgh, Pa.—Samples of tie plates.  
 Dodge & Co., H. B., Chicago, representing Jas. G. Wilson Manufacturing Co., New York.—Models of swing and rolling doors.  
 Dressel Railway Lamp Works, New York.—Samples of signal lamps.  
 Economy Separable Switch Point Co., Louisville, Ky.—Model of "Economy" separable switch points.  
 Eastern Granite Roofing Co., New York.—Samples of perfected granite roofing and sand-surfaced roofing.  
 Electric Storage Battery Co., Philadelphia, Pa.—Samples of "Chloride" and "Exide" accumulators, battery cells, etc.  
 Expanded Metal & Corrugated Bar Co., St. Louis, Mo.—Transparencies showing examples of concrete reinforcement with Johnson corrugated steel bars in bridge abutments, culverts, elevators, storage tanks, retaining walls, etc.; also photographs and full-size samples of Johnson corrugated bars.  
 Eyeless Tool Co., Newark, N. J.—Samples of eyeless picks, hammers, sledges, etc.  
 Fairbanks, Morse & Co., Chicago.—Full-size No. 0 inspection car; also samples of Barrett track jacks, rail drills, stand pipes, wheels, etc.  
 Firefight Sales Co., Pittsburg, Pa.—Literature describing "Firefight" paint; also samples of paint in various colors.  
 Flexible Compound Co., Philadelphia, Pa.—Samples of application of "Flexible" water-proof compound.  
 Franklin Manufacturing Co., Franklin, Pa.—Samples of asbestos shingles, lumber and smoke-jack materials.  
 General Fireproofing Co., Youngstown, Ohio.—Samples of cold-twisted lug bar for concrete reinforcing, expanded metal lath and diamond mesh fabrics, and pin-connected frames for concrete girder and beam reinforcement.  
 Wm. Goldie, Jr., & Co., Bay City, Mich.—Samples of Goldie perfect tie plug.  
 Goodwin Car Co., New York.—Photographs and booklets describing the Goodwin steel dump car.  
 Gordon Battery Co., New York.—Samples of Gordon primary cells.  
 Graves & Co., N. Z., Chicago.—Samples of building and structural paints.  
 Greene, Ernest F., Silver Creek, N. Y.—Model of Greene's automatic safety device for facing point switches.  
 Grip Nut Co., Chicago.—"Grip" nuts in various sizes.  
 Hall Rail Joint Co., Chicago.—Samples of the Hall rail joint for various sized rails.  
 Hayes Track Appliance Co., Geneva, N. Y.—Full-size samples Hayes lifting and Hayes pivot derrails.  
 S. P. Holmes & Co., Chicago.—Samples of "Cellular" steel.  
 Wm. B. Hough & Co., Chicago.—Samples of Ransome twisted bars and sheet steel piling; also literature descriptive of Ransome concrete mixers, bars, Troy wagons and piling.  
 Hussey-Binns Shovel Co., Pittsburg, Pa.—Samples of shovels and scoops.  
 H. W. Johns-Manville Co., New York.—Samples of asbestos roofing, pipe coverings and packings; also electrical devices, fuses, "Transite" board, etc.  
 Kalamazoo Railway Supply Co., Kalamazoo, Mich.—Full-size samples of hand cars, velocipedes, track drills, jacks, gages and levels, new wheel with reinforced tread, Root scraper and flanger, and Moore chuck.  
 Keuffel & Esser Co., New York.—Sample steel tapes, transits, surveying and measuring instruments.  
 Kinnear Manufacturing Co., Columbus, Ohio.—Full-size model of Kinnear rolling door, roundhouse type.  
 B. R. Kozlowski, Chicago.—Model of simplex "T" tie and rail fastenings.  
 Lackawanna Steel Co., New York.—Full-size samples of Abbott track gage plate, Abbott track gage and tie plate, Abbott rail joint plate, Abbott reinforced rail and Abbott composite rail tie.  
 Walter D. LaParle, Chicago.—Samples of combination wire and cable fencing and plate nut locks for railroad crossings.  
 Lehon Co., Chicago.—Samples of "Roofrite" roofing.  
 Lufkin Rule Co., Saginaw, Mich.—Metallic and linen tapes, steel rules, etc.  
 McClintock Manufacturing Co., St. Paul, Minn.—Samples in operation of McClintock mercury contact relay.  
 McCord & Co., Chicago.—Model of new structural steel "Gibraltar" bumping post.  
 McMyer Manufacturing Co., Cleveland, Ohio.—Full-size sample of "Economy" separable switch and Odenkirk switch stands.  
 Morden Frog & Crossing Co., Chicago.—Model of track and switch showing "Security" switch stand, samples "G. L. M." switch stands, working model of "Universal" switch stand, samples of adjustable open side switch sockets; also photographs of Leighton-Hansel continuous rail crossing.  
 National Coal Dump Car Co., Chicago.—Photographs and literature illustrating the "National" coal dump car.  
 National Lock Washer Co., Newark, N. J.—Samples of various sizes of "National" lock washers.  
 National Railway Materials Co., New York.—Samples Murray anti-rail-creeper, guard-rail braces and clamps, rail braces, etc.  
 National Roofing Co., Tonawanda, N. Y.—Samples of "Security" mineral asphalt roofing.  
 Newman Clock Co., Chicago.—Samples of Newman watchman's clocks; also railroad special clock for yards, depots, docks, etc.  
 Geo. P. Nichols & Bro., Chicago.—Catalogue descriptive of Nichols transfer tables, traveling cranes and transfer table attachments.  
 Ohio Motor Co., Sandusky, Ohio.—Sample of Ohio gas and gasoline engine.  
 Jos. Odin, Buffalo, N. Y.—Metallic railroad tie.  
 Otto Gas Engine Co., Philadelphia and Chicago.—Photographs showing: coaling stations, water tanks and cranes, sand blast, and pneumatic tool car.  
 The Pennsylvania Steel Co., Philadelphia, Pa.—Models of "New Century" switch with adjustable stand and double crank, Manard switches; also photographs of steel bridges.  
 Pepple Steel Tie Co., Hillsboro, Tex.—Sample of Pepple metallic railroad tie.  
 Percival Concrete Steel Tie Co., Galveston, Tex.—Samples and photos of Percival reinforced concrete tie.  
 Pruyn Railroad Tie Co., Chicago.—Samples of Pruyn concrete tie.  
 The Rail Joint Co., New York.—Full-size sample of "Continuous" insulated rail joint, "Continuous" standard, Wolhaupter standard and Weber standard, continuous, step and compromise and insulated rail joints.  
 Railroad Supply Co., Chicago.—Samples of Wolhaupter, Q. & W. and Servis tie plates.  
 Railway Specialty & Supply Co., Chicago.—Samples of Smith improved lock nut, P. & M. rail anchor and Buckeye light.  
 Harry Raymond, Chesterton, Ind.—Model of self-closing switch.  
 Arthur E. Rendle, New York.—Full-size sample of "Paradigm" fire-proof windows and skylights.  
 Ritter Folding Door Co., Cincinnati, Ohio.—Full-size sample in operation of Ritter horizontal folding door.  
 Roberts & Schaefer Co., Chicago.—Photographs showing coaling stations erected for various railroads.  
 Rubberset Brush Co., Newark, N. J.—Panel showing illustrations of "Blue Ribbon" paint brushes.  
 St. Louis Frog & Switch Co., St. Louis, Mo.—Souvenir match boxes.  
 Sandusky Portland Cement Co., Sandusky, Ohio.—Samples of Medusa water-proof compound.  
 Scherzer Rolling Lift Bridge Co., Chicago.—Album and miscellaneous photographs showing Scherzer rolling lift bridges.  
 Scott Manufacturing Co., Racine, Wis.—Samples of "Racine" rail anchor and pamphlet describing the "Hercules" bumping post.  
 Sellers Manufacturing Co., Chicago.—Samples of Sellers anchor bottom tie plates and splice bars.  
 Spencer Otis Co., Chicago.—Samples of Hart tie plates and photographs of the "National" coal dump car; also samples of McKee rolled shoulder tie plates.  
 Standard Asphalt & Rubber Co., Chicago.—Samples of water-proof bridge coatings and mastic floors; also pipe dips and insulation materials.  
 Standard Cattle Guard Co., Birmingham, Ala.—Samples Abernathy cattle guard.  
 Standard Patent Appliance Co., Philadelphia, Pa.—Sample of Samson rail bender.  
 Arthur L. Stanford, Chicago.—Model of Stanford rail joint; also sample of "American" track jack.  
 Strauss Bascule & Concrete Bridge Co., Chicago.—Working model of the Strauss trunnion bascule bridge; model of ribbed reinforced concrete bridge.  
 Taylor Iron & Steel Co., High Bridge, N. J.—Full-size samples of "Panama" steel excavator teeth.  
 Templeton, Kenley & Co., Chicago.—Samples of "Simplex" track jacks.  
 Thomas, W. R., Watertown, Wis.—Model of Thomas boltless rail joint.  
 Truss & Cable Fence Co., Cleveland, Ohio.—Samples of wire board fencing.  
 United Indurated Fibre Co., Lockport, N. Y.—Samples of Indurated fibre for rail insulation.  
 U. S. Blue Print Paper Co., Chicago.—Samples of blue print paper, Nigra solar print paper, transits, levels, drawing instruments, drawing pencils and draftsman's specialties.  
 U. S. Graphite Co., Saginaw, Mich.—Literature descriptive of Graphite paint; also sample of graphite, from which this paint is made.  
 U. S. Wind Engine & Pump Co., Batavia, Ill.—Full-size samples of switch stands and semaphores, and literature describing the new U. S. adjustable water columns; also water tanks.  
 Universal Portland Cement Co., Chicago.—Transparencies showing concrete bridges, conduits, bridge abutments, reservoirs, etc., built with "Universal" Portland cement.  
 Verona Tool Works, Pittsburg, Pa.—Samples of track tools, nut locks, gages, etc.  
 Weir Frog Co., Cincinnati, Ohio.—Samples of high switch stand with adjustable throw, heavy adjustable guard rail clamps.  
 Western Railway Supply Co., Chicago.—Sample of Latimer switch point lock for facing point switches.  
 C. H. Whall & Co., Boston, Mass.—Samples of Whall special railroad insulating fibre.  
 Wm. Wharton, Jr., & Co., Inc., Philadelphia, Pa.—Photographs and samples showing Wharton manganese-steel frogs; also switch stands.  
 Jas. G. Wilson Manufacturing Co., New York.—Full-size sample of sliding swing door; also samples of rolling doors.  
 E. J. Winslow Co., Chicago.—Full-size sample of "Hydrolithic" battery vault and chute; also photographs and literature describing "Hydrolithic" battery vaults, cisterns and "Hydrolithic" water-proofing.  
 Wire, Frank E., Libertyville, Ill.—Model of steel tie.  
 S. Woods & Co., Chicago.—Photos of Scaife water purification plants installed on various railroads.  
 Julian L. Yale & Co., Chicago.—Samples of "Universal" cast-iron pipe.

Track Deformations and Their Prevention.\*†

BY G. CUENOT.

Government Engineer of Bridges and Highways, and connected with the Board of Control of the Paris, Lyons & Mediterranean Railway.

III.

STOCK FOR EXPERIMENT.

The first experiments were made by an engine with three axles coupled, weighing 38.58 net tons in working order, with tender of 26.46 net tons.

These weights were thus distributed among the axles:

		Spacing.	Diam. of wheels
Engine, 1st axle.....	12.26 net tons	6 ft. 5 <sup>9</sup> / <sub>16</sub> in.	4 ft. 3 <sup>9</sup> / <sub>16</sub> in.
" 2d ".....	13.37 "		
" 3d ".....	13.37 "	4 ft. 7 <sup>1</sup> / <sub>8</sub> in.	4 ft. 3 <sup>9</sup> / <sub>16</sub> in.
Tender 1st axle.....	13.34 "		3 ft. 11 <sup>1</sup> / <sub>4</sub> in.
Tender 2d axle.....	14.11 "		3 ft. 11 <sup>1</sup> / <sub>4</sub> in.

The locomotive and its tender were followed by a car. After having referenced the top of the tie by means of a measuring rule, the train was brought to position, in such a way that the third axle should be as near as possible to the cross tie. After leaving it in this position for about 10 minutes, the measuring rule was introduced right at the cross tie and the second reading was made. (See Fig. 8.)

EXPERIMENTS OF THE MONTH OF MAY, 1903.

The trials took place on nine wood cross ties and on 21 composite cross ties; the curves of deformation which have been observed are represented with a black line on Figs. 9 and 10. The figures are inscribed in tenths of millimeters.

It is remarked that all the curves of the wood cross ties present

to those stated above, because the rail is more rigid and because it transmits the load over a greater number of cross ties. The deformation reaches the following values at the same points:

5.12 in. from the rail on the side of the long radius.....	.043 in.
At the center.....	.051 "
5.12 in. from the rail on the side of the short radius.....	.059 "

More rigid rails, distributing the pressure on a greater number of cross ties, diminish the flexure, and seem to distribute the load in a more uniform manner on the ballast.

Tests were also made on 21 composite cross ties; their curve of deformation is given in Nos. 1, 2 and 4 to 22 of Fig. 9 (full black line). The latter presents a very characteristic form, a horizontal straight line when the bed of the cross tie is equally resistant, and one which inflects on the side where it is the most compressible. Thus the cross ties of the even-joint, those of the following end above all, which are submitted to the shocks in consequence of the drop of vehicles from the advance one to the following one, inflect on the side of the short radius, following an inclined plane, whose declivity is on the side of the center of curvature. The curve of mean deformation, which includes the aggregate of the curves obtained (Fig. 11, No. 2) has been recorded on the curve of deformation of the wood cross ties supporting P. M. rails like the composite cross ties, in order to show a comparison; but naturally we have separated from the mean the curves of the cross ties of the even-joint, since they have nothing comparable with the wood cross ties. This mean curve is very close to a straight line, since the maximum flexure is 0.12 in. at 5.12 in. from the rail on the side of the short radius; that is to say, four times less in value than with wood cross ties. The mean sinking is about .063 in. less over its whole length, except at its extremity

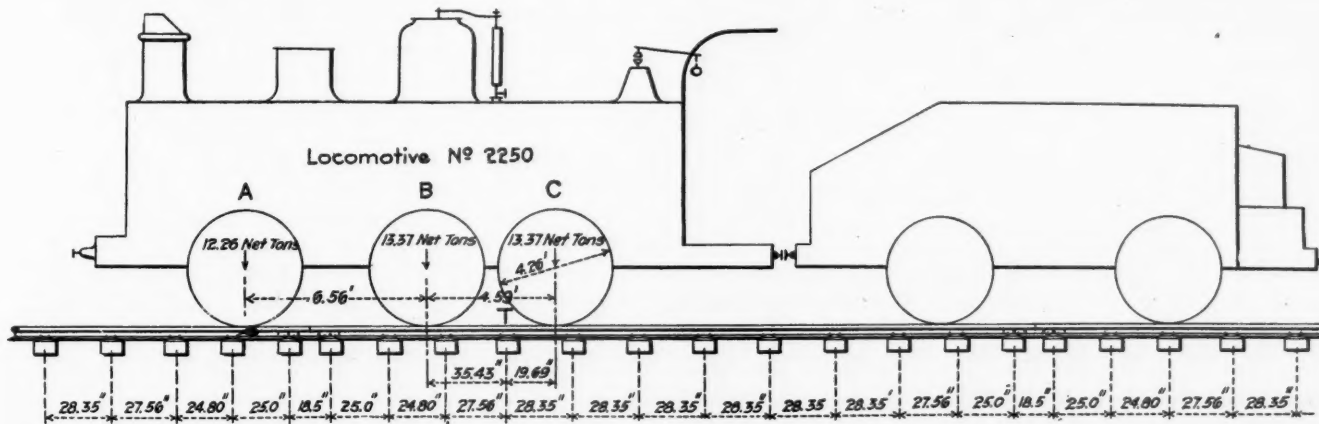


Fig. 8—Comparative Tests of Flexure Under Static Load of Composite and Wood Ties. Distribution of Axle Weights.

The locomotive was placed over the tie, T, so that the tie was 35.4 in. from wheel B, and 19.69 in. from wheel C. All the ties, composite and wood, were loaded in the same manner. This arrangement was made to allow the introduction, between the wheels, of the rule used for measuring the flexure shown in Fig. 6.

a well defined figure, always similar, in the form of a basin. The edges are slightly inclined up to a point near the rail, nearly at 23.62 in. from the axis of the track, and the bottom, which unites the two edges, is nearly horizontal, tending to rise towards the center and thus presenting its convexity upward. The maximum sinking of the cross tie is produced a little beyond the rail, proceeding from the extremities towards the center, and the bending, which consequently gives unequal distribution of the pressure on the ballast, is, so to speak, maximum near the rail, producing a greater sinking than at any other point.

The trials took place on four wood cross ties provided with P. L. M.-A. rails, and five others provided with P. M. rails, these rails being more rigid than the first. Fig. 11, No. 1, on which has been placed the mean of the figures inscribed on Nos. 1, 2, 3 and 4 of Fig. 9 (full black line) gives the general form of the deformation for the five cross ties considered, the errors of reading being thus more or less compensated. This general form is that pointed out above, a basin with slight swelling in the center. The mean cross tie seems to be depressed only slightly at first, a maximum .022 in., then to be inflected in the ballast proportionately to the pressure which it transmits to it. Apart from the general sinking, the piece has bends in relation to the line which joins the extremities of the elastic line defined, bends which are at 5.12 in. from the rail on the side of the long radius, where the inclined part comes to rejoin the bottom of the basin, 0.093 in., at the center 0.085 in., at 5.12 in. from the rail, on the side of the short radius, where the inclined part of the elastic line rejoins the bottom of the basin 0.101 in.

The four cross ties supporting P. M. rails furnish a mean curve of deformation similar to the first, Fig. 11, No. 2; but the mean bending and sinking which results from it are inferior

on the side of the short radius, than the sinking of the wood cross tie.

EXPERIMENTS IN JUNE, 1903.

These experiments took place after a relatively dry period; the ballast was somewhat dried up. The same train was employed. The work was carried on in the same manner, that is to say the third axle was brought as closely as possible to the cross tie to be studied. The trials were made on the same cross ties as before; they were extended, however, to the wood cross tie 21 supporting P. M. rails, and to composite cross tie No. 8. The results of these trials are recorded in Nos. 1 to 9 of Fig. 9, so far as the wood cross ties are concerned, and in Fig. 10 for the composite cross ties; they are represented by full line followed by two dots.

It will be seen that this experiment worked better; the deformation has diminished, which is natural, since the ballast was dried out and the cross ties rest on a more solid and more homogeneous bed throughout its length. Between times, besides, the joints were rewedged by placing hoop-iron between the splicing and the bottom of the base; the effect is perceptible, together with the greater solidity of the bed on the side of the short radius. The flexure and the sinking have diminished considerably.

The mean curve of deformation of the wood cross ties provided with P. L. M.-A. rails, obtained as has been described above (Fig. 11, No. 3) is similar to that which was obtained in the month of May preceding, the same form of basin with a tendency to relief in the central part. The characteristic figures of this curve are the following:

Bending at 5.12 in. from the rail on the side of the long radius....	.092 in.
At the center.....	.091 "
At 5.12 in. from the rail on the side of the short radius.....	.111 "

The apparent sinking of the cross tie has sensibly diminished; its bending has remained nearly the same, which should be expected. For when the ballast is impregnated with water as in the first case, the water sustains the cross tie above the ballast. This

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†Authorized translation by W. C. Cushing, M.A., B.S., Chief Engineer of Maintenance of Way, Pennsylvania Lines West, Southwest System.

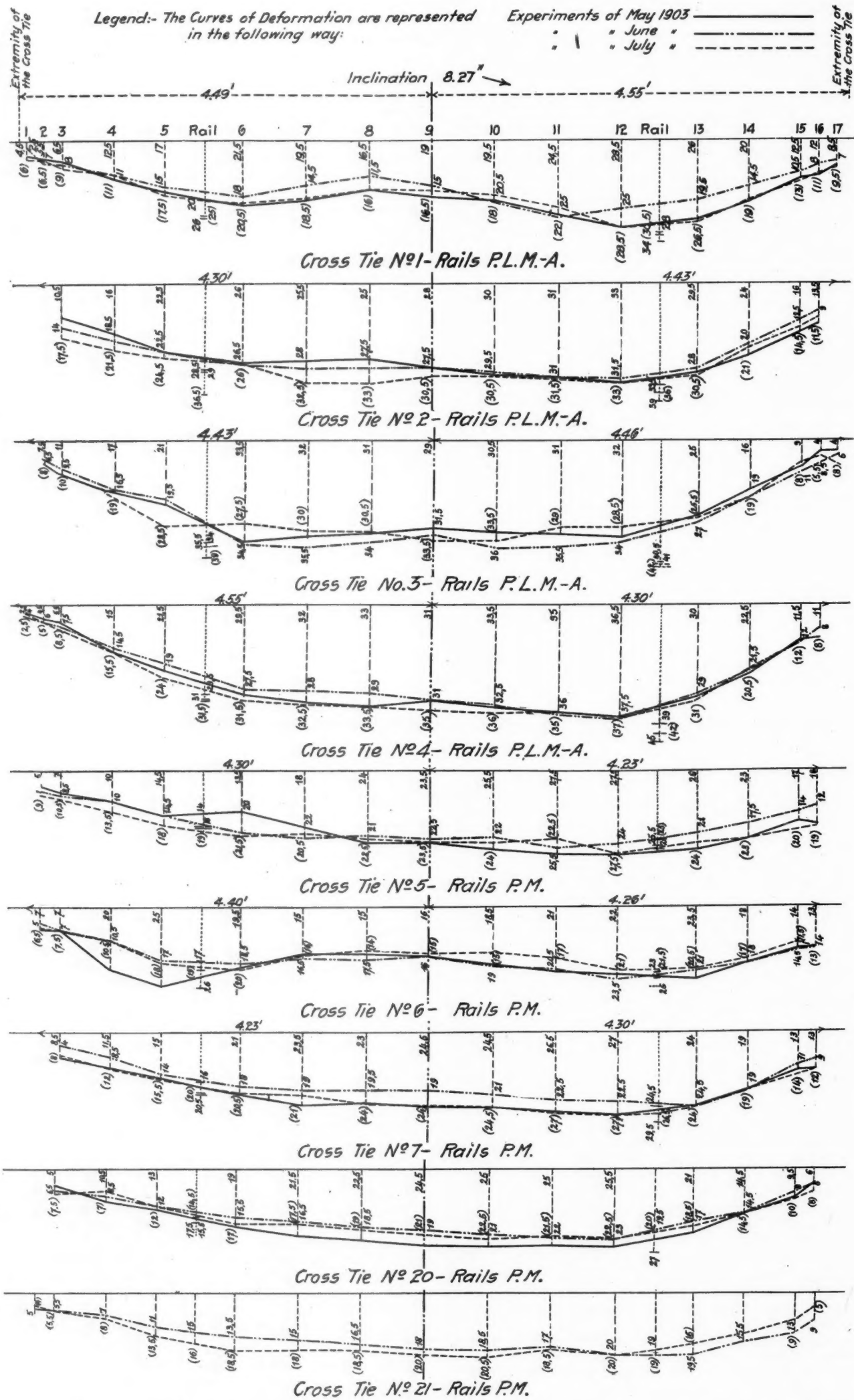


Fig. 9.

water has to be driven out by the tie, spreading on both sides. The void is thus more considerable than when the ballast is more dry, and, in the last case, the cross tie, which is depressed in proportion to the dryness of its support, reaches it more rapidly. In a word, this ballast acts as a sponge when it is impregnated with water; it swells and heaves up the track; on the contrary, when it is dry it diminishes in volume and lowers the track.

The mean curve of deformation of the wood cross ties supporting P. M. rails (Fig. 11, No. 4) presents the same minute details, perhaps less accentuated. The characteristic figures are the following:

Bending at 5.12 in. from the rail on the side of the long radius.....	.043 in.
At the center .....	.043 "
At 5.12 in. from the rail on the side of the short radius.....	.055 "

The mean curve of deformation of the composite cross ties is still more regular than in the first case (Fig. 11, No. 4); the curvature has diminished a little, and a straight line is almost obtained, since the bending is only .008 in., that is to say, five times less than that of the wood cross ties. The mean sinking is no more than .054 in., a little less than the value attained in the month of May.

#### EXPERIMENTS DURING JULY.

These experiments were made during a period of rain, following one of considerable heat. About the same conditions were found as in the month of June. The ballast was not more dried out. The same experimental train was employed and the third axle was placed as near as possible to the cross tie. The experiments were made with the same cross ties. The curves of deformation, represented on Figs. 9 and 10, present the same general form. The flexure and the sinking observed in the month of June are maintained, with a slight tendency to diminish.

The mean curve of deformation of wood cross ties provided with P. L. M.-A. rail, obtained as above (Fig. 11, No. 5), presents some irregularities besides, of little importance. Thus the maximum sinking on the side of the long radius should be produced at 9¼ in. from the rail; the central part should be nearly horizontal, but the maximum sinking should be maintained at 5.12 in. from the rail on the side of the short radius, and should have attained .125 in.

The characteristics of flexure are the following:

Bending at 5.12 in. from the rail (side of long radius).....	.083 in.
At the center .....	.087 "
At 5.12 in. from the rail (side of short radius).....	.094 "

The general sinking is a little more than in June.

The curve of deformation of the cross ties provided with P. M. rails (Fig. 11, No. 6) is almost precisely the same as that in June. The general sinking of the ties is about .051 in. and their flexure can be thus defined:

At 5.12 in. from the rail (side of long radius).....	.043 in.
At the center .....	.043 "
At 5.12 in. from the rail (side of short radius).....	.051 "

The composite cross ties are deformed as a whole, following almost a right line inclined according to the superelevation. Their general sinking is about .055 in. and the greatest flexure about .011 in., four times less than that of the wood cross ties under the same conditions.

#### SUMMARY AND CONCLUSION.

The experiments which we have just related can be summarized in the following table:

Type of tie used.	Mean sinking			Mean flexure		
	May.	June.	July.	May.	June.	July.
Wood, with P. L. M. = A rails.....	.077	.076	.084	.090	.097	.087
Wood, with P. M. rails.....	.066	.060	.066	.047	.043	.043
Composite, with P. M. rails.....	.053	.059	.059	.008	.008	.008

The table shows:

(a) That the mean sinking of the wood cross tie provided with P. M. rails is nearly the same as that of the composite cross tie, although slightly superior.

(b) That its flexure is nearly six times greater.

But it is not necessary to depend upon these results; if it is interesting to know the mean sinking and the flexure of cross ties, it is still more so to know the value of that sinking and of that flexure right at the rail. It is given in the table below:

Type of tie.	Sinking and flexure right at rail.			Mean flexure.
	May.	June.	July.	
Wood with P.M. rails.....	.087 in.	.083 in.	.081 in.	.084 in.
Composite with P.M. rails.....	.073 "	.046 "	.062 "	.065 "

Thus the movement of a track is reduced by 25 per cent. by the employment of the composite cross tie; and this reduction would be still more considerable with rails less worn and a ballast less spongy. Another interesting fact brought out by these experiments is that the wood tie, which is regarded as bearing over its whole length, descends in the track by a greater quantity than the composite tie, which has only a limited bed, 4.59 ft.

We have sought the cause of this anomaly, which did not, at first view, appear explicable. The composite tie exercises a uniform pressure on the ballast at each of its extremities over a length of 27.56 in.; the cube of ballast elastically displaced by this pres-

sure is proportional to the hatched surface of Fig. 11, No. 6. (Experiments of July, 1903). On the side of the short radius this surface is .01942 sq. in., and, on the side of the long radius, is .01307 sq. in.; these two numbers, 1,942 and 1,307, are respectively proportional to the cube of the ballast displaced. Now this cube is itself proportional to the pressure received by the ballast within the limits of elasticity, which ought not to be reached in the particular case; it follows, then, that the wood cross tie, which exercises on its own account an equal pressure, being submitted to the same loading, ought to displace a volume of ballast equal to that which is compressed by the blocks of the composite cross tie, and that its real length of support is determined by this condition. Thus, in the particular case, the length of support of the wood cross tie ought to be the height of the mixti-lineal trapezium comprised between the original axis of the cross tie and its curve of deformation, the surface of which trapezium should be equal to that of the hatched part. It is thus found, by neglecting the extremities of the cross tie which, being removed from the center of pressure, should react feebly, that the surface of support of the wood cross tie, which is indeterminate by reason of the irregularity of the tamping, does not exceed the length of the blocks of the composite cross tie, that is to say that it extends about 13.78 in. on both sides of the axis of the rail. The central part of the cross tie is, therefore, not utilized to distribute the pressure, and serves only as a tie bar to unite the support of the rail. It is even probable that this central bed not only does not press on the ballast, but even that it is uplifted by a kind of sub-pressure, due to the elastic compression of the ballast right at the points of support. The ballast can be likened to an elastic matter, peat for example, which is depressed at the point where the pressure is exercised, only to flow back farther away.

The German engineers who have studied this question with much care, Messrs. Weber, Winckler and Zimmermann, have admitted, without ever having demonstrated it, that the pressure, P, of the ballast per unit of surface of the cross tie which it supports is, at each point, in direct ratio with the sinking, Y, of the latter. They thus place  $P = CY$ , an expression in which C is a coefficient depending upon the qualities of the ballast, invariable for the rest, and whose numerical value is determined by experience.

For  $Y = 1$  cm, we have  $P = C$ . Consequently, it is the pressure in kilograms on the unit of surface (square centimeters) necessary to produce a sinking of 1 cm, and its value introduced into the calculation takes the name of coefficient of ballast.

The hypothesis of the sinking proportional to the pressure can only be admitted within the limits of elastic deformations. The statement of the proportionality of the sinking and of the pressure in certain limits, the determination of the latter as well as the numerical determination of the coefficient of ballast, have given occasion, on the part of German engineers, for researches whose results are the following:

(a) The results of experiments agree quite closely with the supposition that the pressure on the unit of surface is in direct proportion with the measure of the sinking.

(b) With a subsoil supposed to be good, the magnitude of the coefficient of ballast has been found, for gravel ballast (without metallized bed)  $C = 3$ ; for gravel ballast (with metallized bed)  $C = 8$ ; for ballast of small stones and scoriæ,  $C = 5$ .

(c) Loads, such as are found in regular operation, produced, almost exclusively, elastic flexures. The permanent deflections, which have been observed, probably have the effect produced by repetition of dynamic actions as their cause.

(d) The sinking observed under a load in motion, at speeds varying from 40 to 60 kilometers (24.85 to 37.28 miles) per hour, were not much greater than the sinking observed under the same load in a state of repose.

All this very ingenious theory errs in the premises, because its authors have admitted, as an axiom, that a loaded cross tie should have a bearing over its whole length. The experiment made with composite cross ties, whose bed on the ballast is well defined, and which bends little, allows us to pronounce on this point without possible controversy. The pressure which the rail transmits to the ballast by the intermediary of the cross tie is exercised only on a very limited zone of support, a zone which does not exceed 13.78 in. on both sides of the point of application of the load. The German engineers believed that this zone of influence of loads was of tolerably large extent, for they have fixed the length of cross ties at 8 ft. 10.3 in. and recommended the employment of pieces as long as possible. It is the conclusion at which Mr. Ast, notably, has arrived in the fifth section of the International Congress of Railways, in a memorandum on track:

"A better means for distributing the given load on the greatest possible number of cross ties, and, consequently, on the greatest possible surface of ballast, consists in the reduction of the spacing of the cross ties and in increasing their surface of support. These two measures have, however, their limits; the first because it is necessary to preserve the possibility of tamping, the second because, on the one hand, the width of ties cannot be too great, if one wishes

Legend:- The Curves of Deformation are represented in the following way.

Experiments of May 1903

June

July

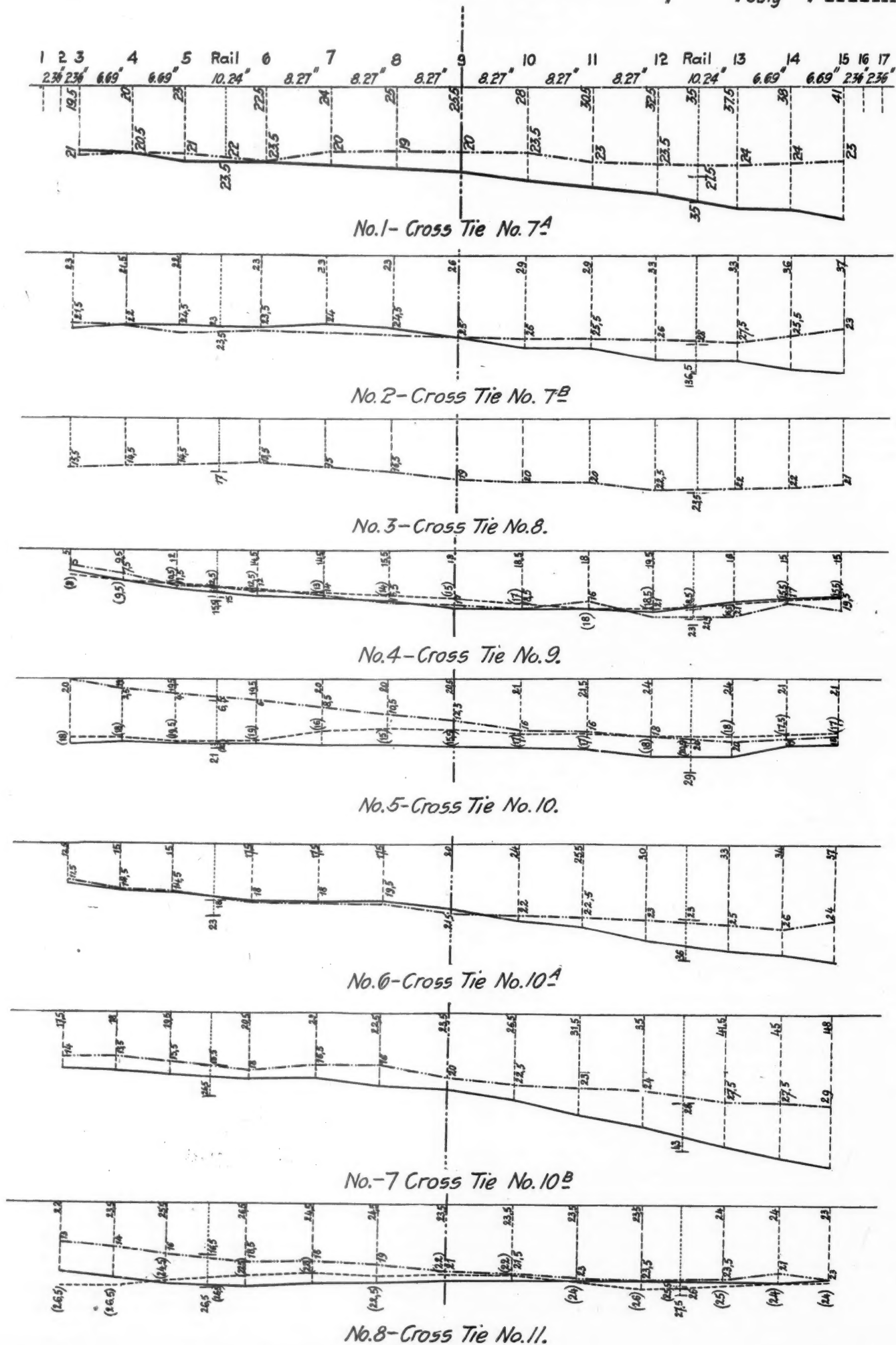


Fig. 10

Legend: The Curves of Deformation of Wood Cross Ties are represented by a full line  
 " " " " Composite " " " dotted

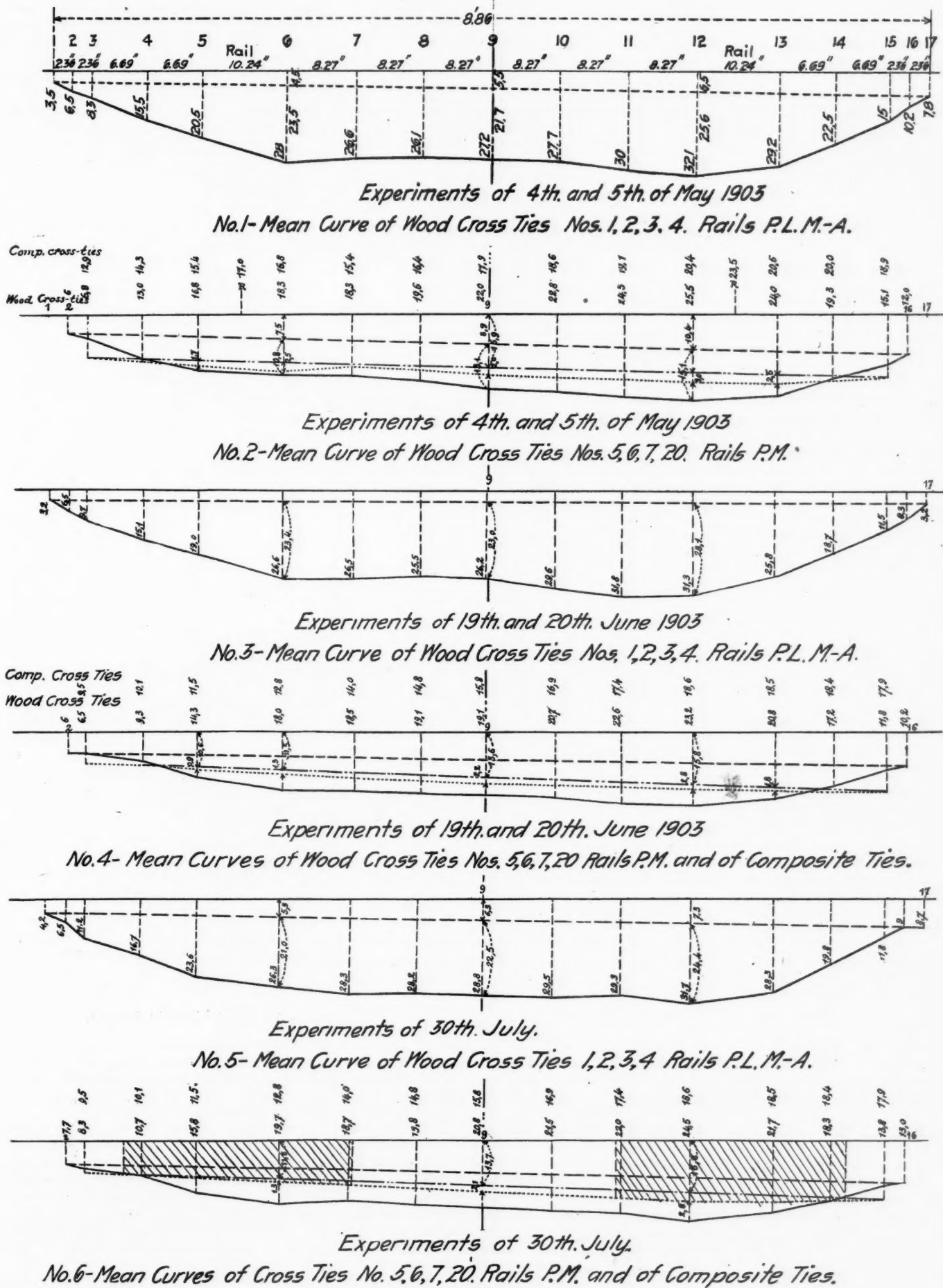


Fig 11.



**Buhrer Concrete Ties.**

The *Concrete Review* quotes Mr. Samuel Rockwell, Chief Engineer of the Lake Shore & Michigan Southern, to the effect that his road is using a tie designed by Mr. C. Buhrer, and that a number of these ties have been in slow track three or four years and will undoubtedly be there a great many years to come. Some were placed in fast track, which, however, pounded to pieces, and Mr. Rockwell believes that they are not suitable for tracks which carry a very heavy traffic at fast speed. On the other hand, he states that this should by no means condemn them for yard tracks, or any other tracks which carry their traffic, however heavy it may be, at a slow speed. Concrete ties have a great field on such tracks wherever wooden ties, on account of sharp curvature, or any other reason, fail to maintain gage, cut out rapidly, or are otherwise objectionable. Over 5,000 of these ties have been made, and 4,200 are in use, as follows:

Lake Shore & Michigan Southern Ry. (Elkhart Div., 1,000; Old Road, 1,003; Sandusky Div., 710; Chicago Div., 230) .....	2,943
Pennsylvania Lines .....	450
Lakeside and Marblehead Ry. ....	550
Sandusky City Water-Works track .....	120
Ann Arbor Ry. ....	77
Lake Erie & Western Ry. ....	24
Wabash Ry. ....	25
Chicago & North-Western Ry. ....	15
Total .....	4,204

**Anti-Railroad Legislation.**

A committee of railroad supply men appointed at an informal meeting at the Union League Club, Chicago, March 5, is circulating the following appeal, headed, "To the American Public—Business is Good; Shall it Continue?":

**Fact 1.** Business has been and is prosperous. There is apparently no commercial reason why we should not enjoy a continuance of such prosperity unless some unnecessary conditions intervene.

**Fact 2.** The National Government has been and is investigating the railroads. The state legislatures have pending 400 bills, none of which is for the benefit of the railroads, but every one of which is designed to reduce in some way the net earnings of the roads. Many village and town authorities are passing ordinances which interfere with the operation of the roads and reduce their revenues. The public press has given wide circulation to all of this agitation and in many instances approved the same.

**Fact 3.** The railroads are stopping all unnecessary expenditures for this year. For instance, one road has stopped construction on 700 miles of new track; another has cut its expenditures \$5,000,000 and stopped work on 400 miles of track in addition. Many roads have issued instructions to use stocks on hand and not to buy anything for six months, except to meet great emergencies. Furthermore: Railroads generally have stopped all plans for expenditures for 1908. No new orders are now being placed by the roads for next year.

We, the undersigned, in view of the above facts, call public attention to the present situation. We are the nearest to the railroads, and, therefore, know the situation, and are the first to be affected. At present business is good on old orders, but we believe that business will be bad unless this agitation is stopped.

We know that if present conditions continue all classes of labor and every business interest will be injured. We know that every manufacturer, every jobber and every retailer in the United States does business directly, or indirectly, with railroads, or their officials and employees. We know that the railroad interest is, next to farming, the largest in the country. We know that when railroads begin to economize it seriously affects every other business. We know that under such conditions labor will suffer very greatly, and that men will be seeking employment.

We believe that now is the time to act, before the damage is done, and that every man who reads this should act. If 10 per cent. of the men in the United States would to-day write to the Governors of the states in which they live, and to their representatives in the state legislatures, stating that this agitation was injuring their business and that it must be stopped, it would be stopped. Every one of these public servants would listen, because every writer is a voter.

We do not object to the regulation of the railroads by the National Government in the proper manner, but we do object to going through a period of hard times similar to that between 1893 and 1897 in order to accomplish alleged railroad reform. The situation is serious. Immediate action is necessary or business will diminish; bank accounts will be reduced; profits will disappear; salaries will be cut; wages decreased; men discharged and thousands will be looking for work. Every laboring man, every business man, every professional man; in fact, every man, is and will be affected. He should act now.

**LEGISLATIVE PROPOSALS REGARDING RAILROADS NOW BEFORE THE PUBLIC.**

**National Government.**—A law has been passed, providing that railroad trainmen shall not work more than 16 hours continuously;

that train dispatchers shall not work more than 9 hours in any 24; that in day and night offices telegraph operators shall not work more than 9 hours in any 24, and in day offices not more than 13 hours in any 24. It is proposed to have the Interstate Commerce Commission make a valuation of the physical properties of the railroads with a view to reducing rates so that no line shall make more than what may be considered a fair profit upon its investment. Another proposition is to invest the Interstate Commerce Commission with authority to supervise the stock and bond issues of railways. It is also proposed to give the commission the power to require the installation of such block signal and other safety appliances as it may think proper.

**Alabama.**—The legislature has passed a bill reducing the maximum passenger fare to 2½ cents per mile. The house has passed a reciprocal demurrage bill. The senate has passed a bill requiring the issuance of interchangeable mileage. A new railroad commission with increased powers of regulation has been created.

**Arkansas.**—The legislature has passed, and Governor Little, as his last official act, signed a law making 2 cents per mile the maximum passenger fare.

**California.**—A reciprocal demurrage bill has been introduced in the senate, which provides that if the shipper applies to a railroad to provide him with cars within a specified time and the railroad fails to provide them within that time, the shipper may collect \$25 per car for each day's delay.

**Georgia.**—A 2-cent passenger fare bill has been passed by the senate. A bill has been introduced in the house, creating a railroad commission with mandatory powers to fix rates.

**Illinois.**—There has been introduced a 2-cent maximum passenger fare bill, a bill reducing sleeping car rates, a reciprocal demurrage bill, and measures providing that railroads shall not increase their bonded indebtedness without the consent of the State Railroad and Warehouse Commission; prohibiting any railroad company or railroad official from owning stock in any concern doing business along the carrier's line; prohibiting corporations from transferring causes from state to federal courts, under penalty of forfeiture of their franchises; and making the rate of fare on a railroad within a city's limits 5 cents, the rate within the county or within 15 miles of a city terminal 10 cents, and up to a distance of 25 miles from the city terminal, 15 cents. Fire escapes on all passenger coaches are required by a bill introduced in the house.

**Indiana.**—A 2-cent passenger fare law has been enacted. A bill has passed the senate fixing the size of the crews on both freight and passenger trains. A reciprocal demurrage bill has been passed by the house.

**Iowa.**—The house has passed a bill requiring railroads to transport livestock at the rate of 18 miles an hour in trains of more than 20 cars, and at the rate of 12 miles an hour in trains of 20 cars or less. A 2-cent passenger fare bill has been passed by both houses. Reciprocal demurrage bills are pending in both houses. The state railroad commission has announced that it proposes to make a thorough investigation of freight rates with the view to extensive reductions.

**Kansas.**—The senate has passed a bill authorizing the railroad commissioners to designate terminal points within the state and to require the railroads to maintain terminals at these points for receiving shipments of freight. A bill is under consideration reducing the fare on sleeping cars 50 per cent. Both houses have passed a bill reducing rates on grain and grain products 15 per cent. and coal rates 18 per cent. The house has passed a 2-cent passenger fare bill.

**Michigan.**—Bills have been introduced providing for reciprocal demurrage and requiring the railroads to carry officers of the state government free at all times, and members of the legislature during sessions.

**Minnesota.**—A bill has been introduced requiring the railroad commission to put in force a distance tariff, the rates to remain in effect until overruled by the courts. Another bill requires the railroads to publish in each issue of all daily and weekly papers in all counties through which their lines run, tables showing the time of arrival and departure of trains and fixing the rate of payment for publication of these tables. The senate has appointed a committee to investigate and report on the cost and value of railroad property in the state and the operating expense of the several lines, despite the protest of the railroad commission that it already was performing the same task. The 2-cent passenger fare bills have passed both houses. The house has passed the reciprocal demurrage bill.

**Missouri.**—A 2-cent passenger fare law has been enacted. A bill requiring the railroads to provide separate cars for white and colored passengers has been passed by the senate. Both houses have passed a bill requiring all railroads doing business within the state to incorporate under its laws and prohibiting any foreign railroad from transferring any suit from a state to a federal court, if brought against a citizen of the state, without the written consent of the person against whom the suit is brought. Reciprocal demurrage bills have been introduced in both houses. The house has passed a bill providing for an eight-hour day for train dispatchers and telegraph operators engaged in the operation of trains. Governor Folk has

sent to the legislature a special message urging the passage of a maximum freight rate law.

**Montana.**—A law has been passed greatly increasing the powers of the state railroad commission. It empowers the commission to establish rates of its own volition.

**Nebraska.**—The legislature has passed a 2-cent passenger fare bill and the Governor has allowed it to become a law without his signature. Reciprocal demurrage bills are pending in both houses. A bill making employers responsible for the injuries to their employees when the carelessness of a fellow servant helps to cause them has been passed by the senate. A bill has been introduced reducing the maximum freight rates on grain from 14 to 20 per cent. Another bill has been introduced reducing the rates on sleeping cars 30 per cent.

**New Hampshire.**—The house has passed a bill requiring every steam railroad operating within the state, "in consideration of its valuable franchise," to furnish free transportation to members, officers and employees of the legislature while it is in session and to all other state officials, except members of the supreme and superior courts and justices of the peace and notaries public.

**New York.**—A bill to compel every single track railroad in the state to double track its road has been introduced. A reciprocal demurrage bill has been passed.

**North Carolina.**—A bill has been passed limiting to 14 hours the period of continuous service of all persons concerned in the operation of trains. The senate has passed the 2½-cent passenger fare bill and the house has passed a 2-cent fare bill. A bill has been introduced in the house prescribing 2¼ cents as the maximum rate on all roads earning as much as \$1,500 a mile.

**North Dakota.**—A bill has been introduced providing for a tax of 4 per cent. on the gross earnings of railroads.

**Oklahoma.**—The constitutional convention has adopted a provision prohibiting steam or electric trains from charging more than 2 cents per mile unless satisfactory proof be given the railroad commission that a reasonable income for investment cannot be earned at this rate of charge. The convention has also adopted provisions prohibiting the consolidation of railroad companies and forbidding railroad ownership of mines and other agencies of production.

**Oregon.**—A bill has been introduced in the house providing for the compulsory free transportation by railroads of all state, district and county officials. Other bills introduced call for the establishment of a railroad commission, the fixing of maximum freight rates, the levying of reciprocal demurrage and the imposition of a three per cent. tax on the gross earnings of railroads. The house has passed a bill prohibiting railroad trainmen from being kept continuously at work more than 10 hours.

**Pennsylvania.**—A senate bill provides for the creation of a railroad commission having extensive powers for the regulation of railroads. Bills introduced in the house make railroad companies liable for loss by fire originating upon the right of way of the railroad or upon adjacent land when caused by sparks from a passing engine, and provide that the existence of fire shall be prima facie evidence that it was caused by the railroad. Another bill requires railroads to aid in extinguishing all fires within 100 ft. of their tracks. The house has passed a bill forbidding common carriers to have any interest in coal property or mining or manufacturing companies along their lines. A 2-cent passenger fare bill has been passed by the house.

**South Carolina.**—A bill has been introduced providing for interchangeable 2,000-mile mileage books. The house has passed a 2½-cent fare bill.

**South Dakota.**—Bills have been introduced for the following purposes, among others: To require all railroad, express, telegraph and telephone companies to reduce their rates 25 per cent.; to reduce the maximum passenger fare to 2 cents per mile; to require the assessment of all railroads at actual cash value; to levy reciprocal demurrage; to limit the working time of employees to 16 consecutive hours; to declare void all rules or contracts by which carriers seek to limit their common law liability; to regulate the size of train crews; to prohibit railroads from closing any station or removing any agent without permission of the state railroad commission; to require the installation of telephones in freight and passenger depots. Both houses have passed a reciprocal demurrage measure. A 2-cent passenger fare bill has been defeated and a 2½-cent passenger bill has been introduced.

**Tennessee.**—A 2-cent passenger fare bill is pending.

**Texas.**—A reciprocal demurrage bill and a bill reducing the maximum passenger fare to 2½ cents are pending.

**Utah.**—A bill has been introduced in the senate making railroads liable for any loss sustained by reason of their failure to immediately transport goods and merchandise to destination and imposing a fine of not less than \$1,000 and not more than \$10,000 if settlement is not made within 10 days after due notice of loss has been given.

**West Virginia.**—A 2-cent passenger fare bill has been passed by both houses, which applies to all lines more than 50 miles in length. A bill creating a railroad commission has been killed in the senate. A reciprocal demurrage bill which is pending fixes a

penalty of \$1 per day to be paid to shipper for every day over four which may elapse from the time he orders a car until it is set on the siding.

**Wisconsin.**—The railroad commission has made a rule reducing the maximum passenger fare on the Chicago & North-Western, the Chicago, St. Paul, Minneapolis & Omaha, and the Chicago & Milwaukee to 2½ cents per mile. The effect will be to make 2½ cents the maximum rate on all railroads within the state. Nevertheless, a bill providing for a 2-cent fare has been introduced in the legislature.

The following is a list of the states in which legislatures have been or will be in session this year, the time of their meeting and the limit of the number of days of their session. (From the *Daily News Almanac*.):

State or territory.	Date of meeting of legislature.	Limit of session.
Alabama .....	Jan., 1907.	50 days.
Arizona Territory .....	" "	60 "
Arkansas .....	" "	60 "
California .....	" "	60 "
Colorado .....	" "	90 "
Connecticut .....	" "	None.
Delaware .....	" "	None.
Florida .....	Apr., "	60 days.
Georgia .....	Nov., "	50 "
Idaho .....	Dec., "	60 "
Illinois .....	Jan., "	None.
Indiana .....	" "	60 days.
Iowa .....	" "	None.
Kansas .....	" "	40 days.
Maine .....	" "	None.
Massachusetts .....	" "	None.
Michigan .....	" "	None.
Minnesota .....	" "	90 days.
Missouri .....	" "	70 "
Montana .....	" "	60 "
Nebraska .....	" "	60 "
Nevada .....	" "	60 "
New Hampshire .....	" "	None.
New Jersey .....	" "	None.
New Mexico Territory .....	" "	60 days.
New York .....	" "	None.
North Carolina .....	" "	60 days.
Oklahoma Territory.* .....	" "	60 "
Oregon .....	" "	40 "
Pennsylvania .....	" "	None.
Rhode Island .....	" "	None.
South Carolina .....	Nov., "	None.
South Dakota .....	Jan., "	60 days.
Tennessee .....	" "	75 "
Texas .....	" "	90 "
Utah .....	" "	60 "
Virginia .....	Dec., "	90 "
Washington .....	Jan., "	60 "
West Virginia .....	" "	45 "
Wisconsin .....	" "	None.
Wyoming .....	" "	40 days.

\*Constitutional convention.

#### German Comment on American Signaling.

Dr. Blum ("Doctor of Engineering"), who was delegated by the Prussian government to study American railroads, begins an article on our methods and appliances for securing safe working of our railroads as follows: "Signaling on North American railroads does not stand on the same plane as on German railroads, and although in certain particulars important results have been attained, the whole system of safety regulations is influenced unfavorably by the method of operation. While with us the whole train movement and switching service within a given district is subject to the orders of a single official, who is responsible therefor, and without whose will no movement can be made, in America there is no responsible trainmaster at a station whom all others have to obey. One can rather say in general, that every locomotive engineer, every yardmaster and switchman is responsible for himself, and that for the avoidance of accidents they must depend upon their conduct towards each other. But since the direction of a single head is lacking, and in that free country the feeling of obedience is not so developed as it is in Germany, as a rule everyone does what he considers right. For example, it several times occurred to me and my companions that we rode on an engine, not only at stations but on the open road, notice of the passage of which had not been signaled at all, and for whose safety no one but the engineman and the fireman took any precautions. It has even happened that we ran over lines of foreign railroads where the engineman depended on asking the track hands whether he could go on."

The city of Geneva has a bone to pick with Swiss State Railroads. The steamboats on Lake Geneva formerly made rates so low to landings on the lakes as to secure pretty much all the freight, greatly to the advantage of Geneva merchants. The State Railroads first endeavored to secure a share of the business by cutting rates. This proving unprofitable to both parties, they pooled the business with the steamboats, in consideration of an advance of the steamboat rates and agreed differences, just as ungodly corporation railroads have sometimes tried to do in America.

# GENERAL NEWS SECTION

## NOTES.

The Interstate Commerce Commission has ordered that after April 1 two copies of every interstate tariff must be sent to the Commission, instead of one copy, as heretofore.

The St. Louis & San Francisco is rebuilding 800 miles of telegraph lines at an expense of \$250,000. On the principal divisions of the company's lines there will be five wires.

On March 23 the New York Central & Hudson River handled 31,440 cars, of which 22,021 were loaded. This is said to be 1,312 more loaded cars than the highest previous record of the road.

The railroads centering in Chicago are trying to agree to stop the practice of absorbing switching charges in that city, which costs them hundreds of thousands of dollars yearly. The eastern and western lines will hold a joint conference.

The New Hampshire legislature has passed a law prohibiting the issuance of free passes to members of the legislature or to state officers. The penalty against both giver and user may be from \$100 to \$1,000. The present mileage compensation of members of the legislature is abolished and a weekly allowance is made to members. The Governor is authorized to contract for railroad transportation of members and of public officers.

It is reported in Seattle that the northern transcontinental lines are to make a considerable increase in the rates on lumber from their western termini to St. Paul. The Great Northern has made more rigid its order forbidding the sending of its freight cars east from Minneapolis. Such cars must not be sent to elevators located on the roads leading to the East. None of the western lines permit their cars to go east of Minneapolis.

In Atlanta last week there was a meeting of the executive officers of 26 short railroads of Georgia, representing about one-quarter of the railroad mileage of the state, to discuss the conditions due to the anti-railroad agitation. They issued a statement to the people of Georgia, setting forth the present conditions, and appealing for more reasonable consideration. Some of the lines aver that they will be thrown into bankruptcy by any reduction.

The Pennsylvania is to establish a third receiving station for miscellaneous freight on the Brooklyn water front. There are now stations at the Williamsburg and Wallabout basin, and the new one is to be at the foot of 52d street, South Brooklyn, from which freight will be carried to the Jersey City terminal of the road. The regular New York rates will apply to shipments from this point. At present one barge a day is to be operated.

A press despatch from Omaha says that the movement of freight over the Union Pacific is now unobstructed. The main line has been congested for more than six months, but since the recent putting of 50 new locomotives in service the blockade has been raised. The railroads extending from Chicago and St. Louis eastward say that the movement of freight over their lines continues heavy, with little sign of abatement before navigation opens on the lakes.

The order issued by the State Railroad Commission of Kansas under the new law requires all roads in that state to place on sale on or before May 1 a 500-mile ticket to be sold at the rate of 2 cents a mile. The law makes a maximum rate of 3 cents for one-way tickets, and requires the roads to sell a 500-mile ticket at 2 cents a mile and a 2,000-mile interchangeable ticket at \$50, with a refund of \$9.50. The roads are so well pleased at having escaped a one-way maximum rate of 2 cents a mile that it is said they will comply with the order without opposition.

A ship broker of New Orleans complains to the Interstate Commerce Commission because the railroads entering that city make demurrage charges on freight handled by local exporters, which are grossly unjust, as compared with the treatment accorded export shipments billed through, on which no demurrage is charged. The railroads have lately cut down the free time allowance to local exporters from 20 days to 10 days. The railroads centering in New York City have given notice that the free storage time allowed on flour and certain other commodities is to be reduced from 10 to four days, and prominent flour dealers say that their business will be destroyed. It is not long since the free time was reduced from 20 days to 10 days.

## Government Tariff Regulations.

The Interstate Commerce Commission has issued tariff circular No. 12-A concerning the filing of tariffs and condemning certain wrong practices. To make a tariff, without due notice, to cover a shipment diverted, because of a flood, is illegal. To make a

tariff, without due notice, to correct a typographical error is also forbidden. If such practices were allowed it would open the way for law-breaking. The commission will act promptly on applications to authorize the use of rates on short notice where there is a real emergency.

The commission recommends that whenever, by reason of blockade, it becomes necessary to divert to the line of another carrier passengers or freight the carrier receiving such traffic shall be paid at regular tariff rates, except when the carrier receiving it is a participant in a joint tariff with the road diverting its traffic, in which case the settlement may be made in accordance therewith. If one carrier's train is sent over the line of another, tariff regulations must be applied, or, in their absence a compensation should be agreed upon.

The commission has decided that interstate tariffs, where used to make interstate rates, by adding together two or more local rates, must be posted and be filed with the commission. Announcement is made that owing to the peculiar nature of the traffic, circuses and other show outfits may be transported on tariffs filed with the commission only one day preceding and not posted.

Regulations are issued applying to misrouting. The carrier must have the shipper choose either an all-rail or rail and water route, where possible. In the absence of specific through routing by shipper, the commission makes it the duty of the agent of the carrier to route shipment over the cheapest reasonable route known to him of the class designated and over which he has rates which he can lawfully use. If a foreign car is available, which must be sent over a particular line or tour over which a higher rate obtains, the agent must give the shipper the choice of paying the higher rate or waiting for another car.

In closing its remarks on this subject, the commission says: "Shippers must bear in mind that there is a limit beyond which an agent of a carrier could not reasonably be expected to know as to terminal delivery or local rates at distant points, and on lines of distant roads to or with which he has no specific joint through rates. Consignors and consignees should co-operate with agents of carriers in avoiding misunderstandings and errors in routing, and must expect to bear some responsibility in connection therewith."

Provision is also made for the refund of overcharge caused by misrouting.

The Commission will soon issue a pamphlet containing a compilation of its rulings in Tariff Circulars 1-A to 12-A, inclusive, revised to date of issue, and including such additional rulings as may then be ready.

## Injunctions Against Rate Reductions.

The principal railroads of Alabama have applied to the United States Circuit Court for injunctions against the enforcement of rate laws recently passed in that state, namely, the General Classification act, in which commodities are classified and rates fixed on 107 commodities; the act reducing the passenger fare from three cents two and a half cents, and the act making the rates that existed, of every class and kind, on January 1 last, the maximum rates. It is alleged that the rates allowed in the measures complained of would be confiscatory. The Louisville & Nashville asserts that under the proposed laws its loss would be \$432,000 a year. The court will hear the suit on March 30. The Federal Court at Jackson, Miss., on the petition of the Louisville & Nashville, has issued a temporary injunction against the enforcement of the order of the Mississippi Railroad Commission requiring interchangeable mileage books to be sold at the rate of 2 cents a mile.

This action of the railroads in Alabama and Mississippi is said to be the first step in a general movement to resist all of the rate reductions recently ordered in the states south of Ohio and east of Mississippi.

## A New Metal Preservative.

Flexible Compound, made by the Flexible Compound Company, 3607 Haverford avenue, Philadelphia, Pa., is an oil product, which can either be mixed with paints to give them greater toughness and elasticity or can be used itself to form a surface on which to apply paint. It is non-inflammable and water-proof. Metal coated with the compound has been immersed in 30 per cent. solutions of sulphuric and nitric acids for 24 hours without showing any effect. Iron or steel structures from which paint has begun to peel, or on which rust has started, are treated with the compound as follows: The rust or paint is scraped off and one or two coats of the preparation applied, the liquid being thin enough to work into the smallest crevice; it then hardens into a flexible elastic skin on which a paint made by mixing pigment ground in oil with a thinning mixture

composed of half compound and half linseed oil is applied. It is claimed that this covering is so elastic as to remain intact at joints in spite of the contraction of the metal in cold weather, and that it has an exceptionally long life. The Flexible Compound Co. had an exhibit at the Maintenance of Way convention in Chicago last week.

#### Decision in Axle-Light Suit.

A decision in the suit of the Consolidated Railway Electric Lighting & Equipment Co. against the Adams & Westlake Co., seeking to restrain the latter company from infringing patent No. 740,982 issued to Patrick Kennedy and held by the complainant company, relating to the outside suspension of dynamos to car trucks in electric car-lighting equipment, was rendered on March 15 by Judge Kohlsaat, of the Circuit Court of the United States for the Northern District of Illinois, Eastern division. Following are extracts from the court's finding:

The claims of the Kennedy patent in substance "call for a dynamo mounted upon an adjustable pivot and supported within removably attached cradle irons, held in position by lugs resting upon the end truck-beam and the rear cross-bar of a bracket-frame provided for that purpose, together with means for keeping the driving belt taut."

"It appears from the evidence that on one occasion defendant's witness, Newbold, at the request of the Pennsylvania Railroad, made one of its cradles removable without dismembering the bracket frame, but aside from this instance no removable cradle has been manufactured by defendant. The Newbold patent excludes the idea of a removable cradle."

"In view of the fact that defendant did on one occasion employ a lighting device, which included all the elements of the patent in suit, and the further fact that, while its cradle is not, *per se*, adjustable, it yet is so constructed that it readily lends itself to such a construction, it should be restrained from exploiting any car-lighting device which employs a removable cradle in combination with the other elements of the patent in suit."

"An injunction may issue restraining defendant from manufacturing, using or selling the device of the patent in suit, limited as above set out."

#### New York Central Officers Indicted for Manslaughter.

The grand jury in New York City March 27 returned three indictments as a result of its investigation into the derailment near Williamsbridge, N. Y., Feb. 16. One of the indictments is against the railroad company, one is against Ira A. McCormack, General Superintendent of the Electric division, and the third against Alfred H. Smith, Vice-President. All three indictments charge manslaughter in the second degree. Judge Rosalsky fixed bail in the cases of Smith and McCormack at \$10,000, which was furnished. The indictments contained the names of 46 witnesses, and the specific crime charged is criminal negligence resulting in the death of Clara L. Hudson, one of the 24 victims of the wreck. Accompanying the indictments was a long presentment, which was not read but was placed upon record. It recommends that the State Railroad Commission take charge of the operation of trains and regulate them.

#### The Early Anthracite Coal Business.

In 1856 what is now known as the Delaware, Lackawanna & Western Railroad was completed from Scranton to Hampton Junction, N. J., connecting with the Morris & Essex Railroad, and then coal was shipped to reach the city of New York and other markets, which the Delaware & Hudson Canal Co. and Pennsylvania Coal Co. had held for a long time. The Pennsylvania Coal Co. commenced shipping on the Delaware & Hudson Canal in 1851. The Lackawanna Company had a hard struggle to get its coal accepted by the public, for while it was equally good, the officials of the Delaware & Hudson Co. and the Pennsylvania Coal Co. spared no efforts to enable them to hold the market; at times the quantity of coal mined was such that during the summer months when the Delaware & Hudson Co. could send their coals to market by canal, there would be dull market due to the overproduction; moreover, it was the custom of the Delaware & Hudson Co. to sell much of its coal on time; the Delaware, Lackawanna & Western Co., though sending its coal daily by railroad, found it difficult to market it, and for some years after it commenced shipping east it carried on monthly sales by auction, and would sell 50,000 to 100,000 tons in lots, I think, of not less than 100 tons; at times prices went down to \$2.50 or \$3 per ton for stove and larger sizes, and these sales had a tendency to partially fix the prices of coal for a month; but the balance of the production for the month usually brought from 10 to 20 per cent. more, and the Delaware & Hudson Co. and Pennsylvania Coal Co. would probably average that much more than the auction sales.

These auction sales were carried on for a few years, and the Delaware, Lackawanna & Western Co.'s coal gradually became known

in the east, and having the western market by reason of railroad connection with the Erie road at Great Bend, its trade increased quite rapidly, so that in a few years its coal stood as well in the markets as that of any other shippers; it has now advanced to the second or third place as to quantity of production.—*Wm. H. Richmond in Mines and Minerals.*

#### "Hogging."

The former head of one of the great railroad brotherhoods told me that while he was at the head of his order one of the hardest things he had to do was to try to keep his men, as he very emphatically expressed it, "from hogging it all"; he was speaking then of times when men were abundant and work not so much so. "There are," he said, "plenty of engineers and trainmen who will go on duty and stay on for 24 hours at a stretch, simply to earn overtime money; and this when very often there are extra men waiting about for a chance to earn a day's wage."

He added this: "No man is in full control of his faculties working under such conditions. I can remember that very well myself as a fireman, when we were on for long hours it was a part of my business from time to time to turn a hose into the engineer's face to freshen him up and keep him awake. When I turned engineer the same thing was done to me. It is next to impossible to keep awake in any other way."—*Carl Snyder in Everybody's Magazine.*

#### New Signal Rules in India.

In the new General Railroad Rules issued by the Government of India fixed signals are divided primarily into "stop" and "warning" signals. The description and functions of a stop signal are not altered, except that the rules recognize the arrangement in which the arm is pivoted near its center on a bracket projecting from the post, and stands vertical, or nearly so in the "off" position; an arrangement designed to prevent the counterweight being outbalanced by snow adhering to the arm.

The "warner" has a fishtailed end to the arm, and red and green spectacles working with it, but always has a second lamp 6 to 7 ft. above its own, whether there be a stop signal above it or not, and the use of warning signals is, as a rule, confined to stations which are interlocked. When the warner is on a post by itself, a fixed green light is always shown at night 6 to 7 ft. above its own spectacle; when the signal shows red, it means "proceed cautiously"; and when green, "all right." In these definitions, the term "distant signal" has entirely disappeared: what has hitherto been so-called fulfilled different functions under different conditions. A "warner" by day is easily distinguished by the fishtail; at night it always has the appearance of being below a stop signal (a position frequently occupied by a distant signal) whether there actually is a stop signal there or not. It is to be used as a rule only at stations which are interlocked, though there is no definition in the rules as to the extent or nature of the interlocking required. The only other condition regarding its working which we can find is that it is never to be taken off for a train that is booked to stop, or for one that has to be stopped out of course.

#### Dr. Waddell Honored by Russia.

Dr. J. A. L. Waddell, Consulting Engineer, of the firm of Waddell & Harrington, Kansas City, Mo., has recently received the beneficent order established not long since by the Grand Duchess Olga, sister of the Czar of Russia. The order is conferred in recognition of Dr. Waddell's services as principal engineer of the projected Trans-Alaska-Siberian Railroad, an enterprise which is considered by the Russian Government to be of great value to the Empire, and which has, consequently, received large grants of land in Siberia. The order has been conferred upon only about 30 eminent men, among them being Monsieur de Lobel, the promoter of the railroad.

#### The Boss Grievers.

I have been told over and over again of such an occurrence as this: "When a man is disciplined, an engineer or a flagman, it is not at all an uncommon procedure for a committee of the union to appear and say: 'We should like to inquire why you happen to single out this man. You know very well that the offense for which he is charged is common enough on your road. Do you pick on him because he happens to be prominent in local No. 99? We want that man reinstated and full pay for all the days which he has been under suspension.'"

The alternative is not a strike, but if the demand is not complied with it will happen that when any differences arise, the men will say: "We are ready to deal with your road but not with Manager A, or Superintendent B, who is against our union." The result is very frequently the removal of the offending manager or superintendent, and the substitution of a more tactful and compliant man. Otherwise the road is pretty sure to have trouble.

I do not for one moment suggest that the higher officials of the railroad union encourage this sort of thing, nor that they are neces-

sarily cognizant of it, but it would be surprising if they were wholly ignorant of it. It is obvious that discipline in such circumstances is next to impossible.—*Carl Snyder in Everybody's Magazine.*

### TRADE CATALOGUES.

**Southern Railway.**—The "Land of the Sky" is the title of an attractive pamphlet issued by the passenger traffic department of the Southern Railway. It describes the plateau lying between the Blue Ridge mountains in western North Carolina, and the Iron, Smoky and Anaka ranges in eastern Tennessee. Something is said about Asheville, Hot Springs, Henderson and other resorts in the region. The letter press is alluring and the scenic views are well selected and artistically reproduced.

**Storage Batteries.**—Catalogue S of the Westinghouse Machine Co., East Pittsburg, Pa., is devoted to storage batteries for stationary service. The construction of these batteries is gone into at some length, and reasons given for their long life and efficiency. The pamphlet illustrates different styles whose eight-hour discharge ranges from five-eighths of an ampere to 1,480 amperes. Measurements, weights and prices of each style and size are given.

**Coaling Stations, Water Tanks, Etc.**—Bulletin 11 of the Roberts & Schaeffer Co., Chicago, gives half-tone views from photographs of locomotive coaling stations, cinder and sand stations and water tanks built by the company for various railroads throughout the country; also coal washers and complete mining plants. Some of the installations have been described in the *Railroad Gazette*; references to these are given in the bulletin.

**Stone Crusher.**—The Contractors' Supply & Equipment Co., Chicago, has issued a catalogue of the Symons rock crushers made by Smith & Post Co., Milwaukee, Wis., for which the former company is selling agent. The Symons is a gyratory crusher; the catalogue describes in detail its structural features and advantages. The illustrations are half-tone engravings and the letter-press is in two colors.

**Bond Between Concrete and Steel.**—The Expanded Metal & Corrugated Bar Co., St. Louis, Mo., has issued as a bulletin the paper on "Tests of Bond Between Concrete and Steel," read by T. L. Condon before the Western Society of Engineers, December 5, 1906, and reprinted in the *Railroad Gazette* of January 18, 1907.

**Vertical Engines.**—The B. F. Sturtevant Company, Hyde Park, Mass., has issued a second edition of bulletin No. 125, describing the company's class V S 5 vertical engines. These engines are built in many different sizes varying from 6 h.p. to 85 h.p. The bulletin is illustrated with half-tones and line drawings, and gives full dimensions of each size.

**Cordage.**—The Samson Cordage Works, Boston, Mass., sends a catalogue of its solid braided rope and cord. Different grades of these are made in sizes up to 1½ in. in diameter. Cords made for special work include train signal cords and trolley cords, for which the company also makes couplings, splice blocks, snaps and other fittings.

**Direct-Current Motors.**—The Allis-Chalmers Company, Milwaukee, Wis., sends a folder describing type K direct-current motors, which it builds for all classes of individual drive where either a constant or variable speed direct-current motor is required.

**Graphite.**—The March number of *Graphite*, issued by the Joseph Dixon Crucible Company, Jersey City, N. J., contains the first chapter of an article on "Feeding Graphite for Lubricating Purposes."

**The Steam Shovel News** for March gives its usual interesting information concerning excavation and other dirt-moving, contract and steam shovel work throughout the country.

### Manufacturing and Business.

S. F. Bowser & Co., Ft. Wayne, Ind., have opened a Chicago office at 210 Fisher Building, with Jas. W. Runyan, Assistant General Manager, in charge.

W. L. Garland has been appointed General Agent of the Safety Car Heating & Lighting Company at Philadelphia, Pa., succeeding B. V. H. Johnson, resigned.

The Davenport Locomotive Works, Davenport, Iowa, has increased its capital stock from \$300,000 to \$1,000,000. The proceeds will be used for improvements.

D. E. Cain, formerly Assistant to the Vice-President, of the

Denver & Rio Grande, is now Manager of the Dearborn Drug & Chemical Works, Denver, Colo.

Wm. C. McMillan, late President of the Michigan Malleable Iron Co., whose death was announced last week, was also President of the Detroit Seamless Steel Tubes Co.

The office of the Manager of Sales of the Western district of the Pressed Steel Car Co. has been removed from the Fisher Building, Chicago, to the Old Colony Building.

W. D. McMahon, formerly Assistant Manager of the Michigan Malleable Iron Co., Detroit, Mich., has been made Manager of the Belle City Malleable Iron Co., Racine, Wis.

On April 1 the machinery sales department of the Quincy, Manchester, Sargent Co. will be removed from Plainfield, N. J., to the new West street building, 90 West street, New York City.

E. M. McIlvain, formerly President of the Bethlehem Steel Company, has been elected President and General Manager of the Robins Conveying Belt Company, Park Row Building, New York.

Magnus Hellstrom, C.E., care A. Hansson, Linnegatan 12, Stockholm, Sweden, desires all the catalogues and literature available on the subject of earth and stone handling machinery, as well as concrete construction machinery and machinery for digging a small canal.

Robert C. Shaal, formerly with the General Storage Battery Company, New York, has been appointed sales engineer of the Bliss Electric Car Lighting Company, with office at the company's New York office, Night and Day Bank Building, Fifth avenue and Forty-fourth street.

The Patterson-Sargent Co., New York, through its Chicago representative, M. R. Stowell, entertained at a "Nobrac" dinner at the Chicago Athletic Club, March 18, a number of the members of the American Railway Engineering and Maintenance of Way Association who were attending the convention in Chicago last week.

The Central Inspection Bureau, New York, has orders from the Blackwood Coal & Coke Co. and from the Parral & Durango Railroad for the inspection of a number of cars to be built at the Middletown Car Works. The bureau has opened offices in the Majestic Building, Detroit, Mich., in charge of J. F. McGregor, District Manager.

Edward Denegre, Mechanical Engineer of McCord & Company, Chicago, died on March 15. He was 51 years old. He was formerly a railroad man, beginning on the Pennsylvania in 1876 as an apprentice, and serving successively thereafter on the Burlington, the Wabash and the Northern Pacific. He left the last named road to go to the Standard Car Truck Co., Chicago, and in 1898 became Mechanical Engineer of McCord & Company.

The Northern Engineering Works, Detroit, Mich., maker of cranes, is adding to its plant an erecting building for electric crane trolleys, about 50 ft. x 100 ft., one-story high, served by a 10-ton electric traveling "Northern" crane, and a two-story building for a tool room and store room, 50 ft. x 50 ft. The buildings are brick and steel with saw-tooth roofs, and are nearly done. The additions will allow more rapid handling of the business and will considerably increase the capacity of the plant.

The Stewart Iron Works Co., Cincinnati, Ohio, maker of fences and iron work, including wire and iron window guards, wickets, gates and miscellaneous iron work for park improvements, reports orders filled recently for the Illinois Central, the Chicago & North-Western, the Big Four, the Cincinnati, Hamilton & Dayton, the Southern, the Atlantic Coast Line, the Erie, the Philadelphia & Reading, the New York Central & Hudson River, the Pennsylvania Lines East, the Pennsylvania Lines West, the Louisville & Nashville and the Chesapeake & Ohio.

The Warren Electrical Manufacturing Company, Sandusky, Ohio, has bought the plant and good will of the Warren Electric Manufacturing Company of that city. In addition to the "Warren" alternator, it will make a full line of revolving-field type generators, also a.c. and d.c. motors, transformers, etc. The officers of the new company are: Millard H. Nason, President, also President of the Brilliant Electric Co., Cleveland, Ohio; Frank Warren, Secretary, hitherto Secretary of the Warren Electric Mfg. Co., and Norman L. Hayden, General Manager, formerly President of the Hayden & Derby Mfg. Co., New York, and now General Manager of the N. L. Hayden, Mfg. Co., Columbus, Ohio.

Two large Allis-Chalmers direct-current generators are to be installed in the new extension to the Boston Elevated's Lincoln wharf station, on Atlantic avenue. In this station is generated the larger portion of the current used for operating the elevated railway division and the cars through the East Boston tunnel. The generators will have a capacity of 2,700 k.w., 600 volts, and operate at a speed of 75 r.p.m., and will be driven by vertical cross compound engines. The Allis-Chalmers Company also has a contract,

duration not stated, for supplying air-brake equipment for all of the 4,000 cars on the street and interurban electric lines controlled by the New York, New Haven & Hartford.

#### Iron and Steel.

The Carnegie Steel Company has orders for about 750,000 tons of rails for 1907 delivery, including light rails and rails for export.

The Michigan Central is reported in the market for 3,000 tons of bridge material, and the Boston & Maine and Central of New Jersey are also negotiating for fabricated steel.

The United States Steel Corporation last week received orders for 20,000 tons of rails, including 3,000 tons for the Nevada Northern, 3,000 tons for the Lehigh Valley, and 14,000 tons for various other roads.

#### OBITUARY NOTICES.

E. J. Yard, Chief Engineer of the Denver & Rio Grande, died on March 23.

R. H. Rutherford, Master Mechanic of the Mexican Central at Aguascalientes, died suddenly of pneumonia on March 15.

William H. Lewis, formerly Master Mechanic of the Delaware, Lackawanna & Western, died at his home in Hoboken, N. J., on March 20. Mr. Lewis was born in 1828 at Quaker Ford, Glamorgan-shire, Wales. He began railroad work in 1849 as a machinist on the Beaver Meadow Railroad, now part of the Lehigh Valley. He was locomotive engineer and foreman of shops of the Hudson River Railroad (now part of the New York Central) at Greenbush, N. Y., from 1854 to 1871. He then went to the Delaware, Lackawanna & Western, where he served as Master Mechanic until 1899.

General Joseph F. Boyd, Purchasing Agent of the Cumberland Valley, died of paralysis on March 23. General Boyd was 74 years old. He began railroad work in 1853 in the office of the Master of Transportation of the Bellefontaine & Indiana, now part of the Big Four, and the next year was made General Freight and Ticket Agent of that road and of the Bellefontaine Railway. In 1860 he went to the Louisville & Nashville with the same title, which position he left to serve in the Civil War. He was for some months in 1865 Superintendent of the United States Military Railroad for the department of North Carolina. At the end of the war he resigned from the service, having been made Brevet Brigadier General, and returned to the Louisville & Nashville as Auditor and General Passenger Agent. In 1867 he went to the Memphis & Ohio, now part of the L. & N., and four years later was made Superintendent of the St. Louis & Southeastern, also now part of the Louisville & Nashville. In 1873 he was appointed Superintendent of the Cumberland Valley, where he remained until he was appointed Purchasing Agent in January, 1903.

#### MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

#### Air Brake Association.

The fourteenth annual convention of the Air-Brake Association will be held in Columbus, Ohio, on May 14, one month later than the regular time. The chairman of the Committee on Entertainment is S. D. Hutchins, 1132 Columbus Savings and Trust Building, Columbus. The convention headquarters will be at the Great Southern Hotel, corner of High and Main streets. The Secretary of the Association is F. M. Nellis, 53 State street, Boston, Mass.

#### ELECTIONS AND APPOINTMENTS.

##### Executive, Financial and Legal Officers.

*Aberdeen & Rockfish.*—J. W. Phillips has been appointed Auditor, with office at Aberdeen, N. C., succeeding G. P. Bourdelat.

*Chicago, Rock Island & Pacific.*—A. S. Dodge, Assistant to the Third Vice-President, has resigned.

*Cincinnati, New Orleans & Texas Pacific.*—Alexander Telford, Purchasing Agent, has been appointed Assistant Secretary, succeeding J. W. Wood, resigned.

*Grand Trunk.*—See Great Northern.

*Great Northern.*—F. H. McGuigan, Fourth Vice-President of the Grand Trunk, has been elected to the new office of First Vice-President of the Great Northern.

*Long Island.*—Franklin B. Lord has been elected a Director, succeeding James H. Hyde, resigned.

*Missouri & North Arkansas.*—D. R. Francis has been elected Chairman of the Board.

*Nevada Northern.*—J. H. Underwood, chief clerk in the office of the Auditor of the Colorado Midland, has been appointed Auditor of the Nevada Northern.

*New York, Philadelphia & Norfolk.*—Henry W. Biddle has been elected a Director, succeeding A. J. Cassatt, deceased.

*Tavares & Gulf.*—W. M. Brittain has been elected Vice-President and General Manager, with office at Clermont, Fla.

#### Operating Officers.

*Boston & Albany.*—J. B. Stewart, General Superintendent, has been given leave of absence on account of ill health, and his duties will be performed by W. J. Fripp, recently appointed Assistant General Superintendent.

*Central of Georgia.*—C. T. Airey, Assistant General Freight Agent, has been appointed to the new office of General Freight Traffic Manager, effective April 1.

*Chicago, Rock Island & Pacific.*—W. S. Tinsman, General Superintendent of the Southwestern district, has been appointed Assistant General Manager, with office at Chicago. A. E. Sweet, Assistant to the Second Vice-President, succeeds Mr. Tinsman, with office at Topeka, Kan.

*Chihuahua & Pacific.*—C. L. Graves, General Manager, has resigned to go into other business.

*Cleveland, Cincinnati, Chicago & St. Louis.*—J. R. Cavanagh, Superintendent of Car Service, has been appointed to the new office of Superintendent of Transportation, effective April 1.

*Denver & Rio Grande.*—See Rio Grande Western.

*El Paso & Southwestern.*—George F. Hawks, General Superintendent of the Houston & Texas Central, the Houston, East & West

Texas, and the Houston & Shreveport, has been appointed to the new office of General Superintendent of the El Paso & Southwestern, with office at El Paso, Tex., effective April 1. Mr. Hawks was born at Kirkland, Ohio, on August 28, 1857, and was educated at the Rockville, Ind., high school. He began railroad work in 1874 as a brakeman on the Logansport, Crawfordsville & Southwestern, now part of the Vandalia; he served as a brakeman on the Wabash, and later as conductor on the Pekin, Lincoln & Decatur, the Chicago, Peoria &



George F. Hawks.

Southwestern, the Canadian Pacific and the Atchison, Topeka & Santa Fe, until 1890; he was then made Trainmaster of the Panhandle division of the last named road, and served for six years in this position on various divisions. In 1897 he went to the Mexican Central as train inspector, and was appointed Superintendent of the San Luis division of that road in 1898; he was transferred to the Mexico division in 1900, but after a year resigned on account of ill health. He soon went to the Southern Pacific as Trainmaster of the Texas & New Orleans, now the Louisiana Western. He was made Assistant Superintendent of the Louisiana lines in 1902, and Superintendent of the El Paso division of the Galveston, Harrisburg & San Antonio in 1903. The next year he was made Superintendent of the Texas & New Orleans and the Galveston, Houston & Northern. In the spring of 1905, he was appointed to the position which he is now about to leave to go to the El Paso & Southwestern.

*Galveston, Harrisburg & San Antonio.*—See Houston & Texas Central.

*Houston & Shreveport.*—See Houston & Texas Central.

*Houston & Texas Central.*—G. Radetzki, Superintendent of the Galveston, Harrisburg & San Antonio at Victoria, Tex., has been appointed General Superintendent of the Houston & Texas Central, of the Houston, East & West Texas, and of the Houston & Shreveport, with office at Houston, Tex., effective April 1, succeeding G. F. Hawks, resigned to go to the El Paso & Southwestern.

*Houston, East & West Texas.*—See Houston & Texas Central.

**Missouri, Kansas & Texas.**—See St. Louis Southwestern.

**Mobile, Jackson & Kansas City.**—J. G. Glazier, Superintendent of the Mobile division, has resigned. C. F. Morgan, Trainmaster at New Albany, Miss., has been appointed Superintendent of the New Albany division.

**New Orleans Terminal.**—R. B. Fowler, Superintendent, has been appointed General Manager.

**Pennsylvania.**—Hereafter the Lines East will be operated in five grand divisions instead of four. The new grand division is the Western Pennsylvania, and it includes the Pittsburgh division, the Western Pennsylvania division and the Monongahela division, all heretofore part of the Pennsylvania Railroad grand division, and also that part of the Allegheny division of the Buffalo and Allegheny Valley grand division running from Pittsburgh to Kiskiminetas Junction. The names of the following grand divisions have been changed: Pennsylvania Railroad grand division to Eastern Pennsylvania grand division; United Railroads of New Jersey grand division to New Jersey grand division; Philadelphia & Erie Railroad grand division to Erie grand division. The territory of the Western division of the Erie grand division has been extended to include the line heretofore constituting the Middle division. S. C. Long, Superintendent of the Pittsburgh division, has been appointed General Superintendent of the Western Pennsylvania grand division. R. T. Morrow, Superintendent of the Western Pennsylvania division, succeeds Mr. Long. Andrew Keiser, Assistant Superintendent of the Pittsburgh division, succeeds Mr. Morrow. D. C. Stewart, Superintendent of Telegraph, succeeds Mr. Keiser. J. B. Fisher, Freight Trainmaster of the old Middle division, succeeds Mr. Stewart.

**Rio Grande Western.**—W. A. Whitney, Superintendent of Transportation of the Denver & Rio Grande, has been appointed Superintendent of the Rio Grande Western, succeeding George Geiger, resigned. H. J. Roth has been appointed Assistant Superintendent at Salt Lake City, succeeding E. H. Holden.

**St. Louis Southwestern.**—J. W. Maxwell, Assistant General Manager of the Missouri, Kansas & Texas, has been appointed General Superintendent of the St. Louis Southwestern, with office at Tyler, Tex., succeeding W. E. Green, resigned to go to another company.

#### Traffic Officers.

**Chicago & Eastern Illinois.**—E. J. Knickerbocker, Coal Traffic Manager, has been appointed to the new office of Assistant General Freight Agent.

#### Engineering and Rolling Stock Officers.

**Chicago, Rock Island & Pacific.**—W. J. Tollerton, Superintendent of Motive Power at Topeka, Kan., has been appointed to the new office of Assistant General Superintendent of Motive Power.

**Cincinnati, New Orleans & Texas Pacific.**—See Norfolk & Southern.

**Norfolk & Southern.**—J. W. Stewart, Chief Engineer of Construction, having resigned to go to another company, the duties of Chief Engineer will, after April 1, be performed by C. O. Haines, Vice-President, whose office is at Raleigh, N. C. All reports heretofore made to the Chief Engineer will be made to the Principal Assistant Engineer. T. W. Cothran has been appointed Principal Assistant Engineer, with office at Raleigh, N. C. W. P. Marshall has been appointed Division Engineer at Wilson, N. C. C. C. Fitzgerald, Division Engineer of the Cincinnati, New Orleans & Texas Pacific at Somerset, Ky., has been appointed Division Engineer of the N. & S. at Washington, N. C.

#### Purchasing Agents.

**Cincinnati, New Orleans & Texas Pacific.**—See this company under Executive, Financial and Legal Officers.

### LOCOMOTIVE BUILDING.

**The Mobile & Ohio,** it is reported, is figuring on 40 locomotives.

**The Boston & Albany,** it is reported, is figuring on 20 locomotives.

**The Nicaragua Government Railways** will shortly be in the market for several locomotives.

**The Andine Railway,** Rio Cuarto, Cordoba, Argentine, will shortly be in the market for several locomotives.

**The Mexico, Oaxaca & Yucatan,** 10 Wall street, New York, is about to order four second-hand locomotives for construction work.

**The Council City & Solomon River** will shortly be in the market

for locomotives, which will be ordered through A. D. Keep, Hanover National Bank Building, New York.

**The Pennsylvania** has ordered from its Juniata shops 20 class H6b consolidation (2-8-0) type locomotives; 20 class B8 switching locomotives, and six class E2d Atlantic (4-4-2) type locomotives.

**The Silveira Sugar Company** is about to order some locomotives for its Cuban plantation. The contract will be placed through Czarnikow, MacDougall & Company, Limited, 115 Wall street, New York.

**The Temiskaming & Northern Ontario,** as reported in the *Railroad Gazette* of March 22, has ordered from the Locomotive & Machine Co., of Montreal, six simple 10-wheel freight locomotives. The specifications are as follows:

Weight on drivers .....	112,000 lbs.
Total weight .....	144,000 "
Diameter of cylinders .....	19 in.
Stroke of pistons .....	24 "
Diameter of drivers .....	57 "
Type of boiler .....	Extended wagon top
Working steam pressure .....	180 lbs.
Heating surface, total .....	1,780 sq. ft.
Tubes, number .....	239
material and maker .....	Mannesman steel.
outside diameter .....	2 in.
length .....	13 ft. 2 5/16 "
Firebox, length .....	103 "
Firebox, width .....	42 "
Grate area .....	30 sq. ft.
Tank capacity for water .....	5,000 imp. gals.
Coal capacity .....	10 tons

#### Special Equipment.

Air brakes .....	Westinghouse
Bell ringer .....	Pneumatic
Boiler lagging .....	Carey's magnesite lagging
Brake-beams .....	Simplex
Couplers .....	Tower
Headlights .....	Pyle electric
Injector .....	Ohio
Journal bearings .....	Canadian Bronze Co.
Piston rod packings .....	U. S. Metallic
Valve rod packings .....	U. S. Metallic
Safety valve .....	Coale encased
Sanding device .....	Wilson pneumatic
Sight-feed lubricators .....	Detroit Bull's-eye
Steam heat equipment .....	Consolidated

### CAR BUILDING.

**The Nicaragua Government Railways** will shortly be in the market for several cars.

**The Pittsburgh & Lake Erie,** it is reported, is asking prices on some passenger equipment.

**The Fort Smith Lumber Co.,** Adona, Ark., is said to be in the market for some logging cars.

**The Andine Railway,** Rio Cuarto, Cordoba, Argentine, will shortly be in the market for several cars.

**The Illinois Central** is in the market for two dining cars, and is also said to be in the market for 15 day coaches.

**The Mexico, Oaxaca & Yucatan,** 10 Wall street, New York, is about to order about 250 cars for construction work.

**The Georgia Machine & Equipment Co.,** Atlanta, Ga., it is reported, is in the market for six standard second-hand flat cars.

**The Pennsylvania** is believed to have ordered 150 steel passenger cars, and to be about to build some steel passenger cars at Altoona.

**The Council City & Solomon River** will shortly be in the market for several cars, which will be ordered through A. D. Keep, Hanover National Bank Building, New York.

**The New York, Chicago & St. Louis,** as reported in the *Railroad Gazette* of January 4, has ordered five coaches and six baggage cars from the American Car & Foundry Co.

**The Silveira Sugar Company** is about to order 100 cars for its Cuban plantation. The contract will be placed through Czarnikow, MacDougall & Co., Limited, 115 Wall street, New York.

**The Boston & Maine,** according to press despatches, is having built four parlor cars, one combination parlor and baggage car, six dining cars, 20 vestibule cars and 30 coaches by the Pullman Company, and 12 caboose cars by the Laconia Car Company.

**The Chicago, Indianapolis & Louisville** has ordered 300 wooden flat cars and 200 box cars of 80,000 lbs. capacity from the Haskell & Barker Car Co., and three baggage cars from the American Car & Foundry Co., and will build ten cabooses at its Lafayette shops.

**The Seaboard Air Line,** as reported in the *Railroad Gazette* of March 22, has ordered 50 Hart convertible cars of 80,000 lbs. capacity from the Rodger Ballast Car Company. These cars will measure 34 ft. 2 in. long, 8 ft. 8 in. wide and 4 ft. high, inside measurements, and 36 ft. long, 10 ft. 2 3/4 in. wide and 8 ft. 2 1/4 in. high, over all. Bodies and underframes will be of wood. The special equipment includes: Westinghouse brakes, Tower couplers, Farlow draft rigging and Symington journal boxes.

The Norfolk & Western, as reported in the *Railroad Gazette* of March 22, has ordered from its Roanoke, Va., shops 243 40-ton flat cars. These cars will weigh 31,000 lbs., and will measure 40 ft. long, 9 ft. 5 in. wide and 4 ft. 3½ in. high, over all. Bodies and underframes will be of wood. The special equipment includes:

Bolsters .....	Cast steel
Brake-beams .....	Norfolk & Western deck beam
Brakes .....	Westinghouse
Brasses .....	Ajax Plastic Bronze
Draft rigging .....	Butler
Dust guards .....	Wood
Springs .....	Union Spring & Mfg. Co.
Trucks .....	Barber

The Brooklyn Rapid Transit, as reported in the *Railroad Gazette* of March 15, has ordered through the Transit Development Company from the J. G. Brill Co. 100 semi-convertible street railway passenger motor cars, to be built at Elizabeth, N. J., and from the Laconia Car Co. and the Jewett Car Co. 100 semi-convertible motor cars for elevated service, for October, November and December delivery, half of the order being given to each company. The surface cars will weigh 33,000 lbs. and will seat 38 passengers; they will measure 27 ft. 3¼ in. long, 7 ft. ½ in. wide, and 8 ft. 1¾ in. high, inside measurements, and 38 ft. 3¼ in. long, 8 ft. ½ in. wide and 8 ft. 11¼ in. high, over all. Bodies and underframes will be of wood. The elevated cars will weigh about 69,000 lbs., and will seat 54 passengers; they will measure 39 ft. 5 in. long, 7 ft. 6 in. wide and 8 ft. 3¾ in. high, inside measurements, and 48 ft. 11 in. long, 8 ft. 7 in. wide and 9 ft. 4½ in. high, over all. The bodies will be of wood with steel in corners and double posts, and the underframes will be of pressed steel. The special equipment for the above cars is as follows:

	Surface.	Elevated.
Bolsters, body .....	Built-up bar steel.	Pressed steel.
Bolsters, trailing truck .....		Steel plate truss.
Brake-shoes .....	Am. Brake-Shoe & Fdy.	
Brakes .....	Bklyn Hgts R.R. stand.	Inside hung.
Couplers .....		Van Dorn automatic.
Curtain fixtures .....	Acme open car cable.	Curtain Supply Co.
Curtain material .....	Pantasote.	Pantasote.
Door fastenings .....		Coburn tracks and sheaves.
Dust guards .....	Wood.	Wood.
Headlights .....	Dayton incandescent.	Eureka arc.
Heating system .....	Consol. Car Htg. Co.	Consolidated Panel electric heaters.
Platforms .....	Vestibule, without sides	
Roofs .....	Monitor.	Monitor.
Seats .....	Heywood Bros. and Wakefield Co. rattan covered.	
Trucks .....	Standard Motor Truck Co.	
Wheels .....		Schoen steel.

#### RAILROAD STRUCTURES.

ALEXANDRIA, LA.—An agreement has been made to build a brick and stone passenger station for the joint use of the Texas & Pacific, the St. Louis, Iron Mountain & Southern, and the St. Louis, Watkins & Gulf. Work is to be started within six months.

CHICAGO, ILL.—The Chicago & North-Western is to put up a bridge over the Chicago river at Kinzie street to be one of the heaviest of its kind, at a cost of \$200,000. The total weight will be 1,300,000 lbs., though the total length will be only 170 ft., and the width at the central trusses 30 ft. It will be operated by two electric motors of 50 h.p. each. Work is to be begun at once.

GARDEN CITY, KAN.—The Atchison, Topeka & Santa Fe, it is said, will put up a new station here to cost \$20,000.

INDIANAPOLIS, IND.—The Evansville & South Indiana Traction Company wants bids April 15 for putting up a two-story brick passenger and freight station; also for putting up car barns at Princeton, Ind.

KANKAKEE, ILL.—The Chicago, Indianapolis & Southern will build a new shop here to cost \$100,000.

LOS ANGELES, CAL.—The Southern Pacific, it is said, has plans ready for a new arcade station to cost \$250,000 to be built during the present year.

MEMPHIS, TENN.—The freight house of the Illinois Central at Shelby and Calhoun streets, together with 25 loaded and 60 empty freight cars, was destroyed by fire March 21. The estimated loss is \$65,000.

NEW ORLEANS, LA.—President C. C. Harvey, of the New Orleans Terminal Company, announces that bids will be called for at once for the construction of a passenger station at Canal and Basin streets, and that as soon as the contract is awarded the work will begin. The station is to cost \$200,000.

NEW YORK, N. Y.—Two bills are before Governor Hughes for approval. One is to extend the temporary Brooklyn Bridge terminal structure into City Hall Park and the other authorizes the construction of the permanent loop terminal station on the site at Park Row and Centre street. Mayor McClellan has signed both measures in behalf of the city, and it is expected that Governor

Hughes will sign them also. Bridge Commissioner Stevenson says that within two weeks after the Governor signs the bills he will be ready to let the contract for the temporary structure into City Hall Park, and a week later he will be ready to let the first contract for the construction of the permanent loop station.

NORWALK, OHIO.—The Wabash and the Wheeling & Lake Erie, it is reported, have decided to enlarge the shops here. The new work will begin shortly. The proposed new shops at Brewster may not be built for a year or so, as the improvements at Norwalk will enable the company to care for all shop work on the Wheeling & Lake Erie and a portion of the Wabash-Pittsburg terminal.

ORANGE, TEX.—The Southern Pacific is negotiating with residents of this place to secure land for its proposed passenger station here.

ST. JOHN, N. B.—Bids are wanted April 1, by W. Downie, General Superintendent Atlantic division of the Canadian Pacific, for building concrete abutments and piers as follows: Two abutments, Fredericton branch, Russiadorris, N. B.; four abutments, Tobique branch, Lieford, N. B.; two abutments, Aroostook branch, Fort Fairfield, Maine; two abutments and one pier, Edmundston branch, Grand River, N. B.; two abutments and three piers, Edmundston branch, Aroostook Junction, N. B.; two abutments and three piers, Edmundston branch, Grand Falls, N. B.

SPRINGFIELD, MASS.—The Boston & Albany is planning to put up a new roundhouse here.

SUPERIOR, WIS.—The Northern Pacific, it is said, has plans made to double-track the railroad bridge between Superior and Duluth, and make other improvements at a cost of \$500,000.

SYRACUSE, KAN.—The Atchison, Topeka & Santa Fe, it is said, will put up a new station here to cost \$65,000.

WINNIPEG, MAN.—The Bridge Commissioner has reached an agreement with the Canadian Pacific for the construction of an overhead bridge to cost \$70,000. The proposed structure, with approaches, will be 2,175 ft. long.

#### RAILROAD CONSTRUCTION.

##### New Incorporations, Surveys, Etc.

ALABAMA NORTHWESTERN.—Under this name a company is reported being organized to build from Gadsden, Ala., northwest to Tusculumbia and Sheffield, 110 miles.

ATCHISON, TOPEKA & SANTA FE.—According to reports, this company has given a contract to McCabe & Steen, for work on its proposed connecting line from Texico, N. Mex., south to Brownwood, Tex. Work, it is said, will be started near Coleman in April.

AUBURN, MECHANICS FALLS & NORWAY (ELECTRIC).—A bill is before the Maine Legislature to permit a company under this name to buy and consolidate lines centering in Bangor, Augusta, Lewiston, Bath and Brunswick. John R. Graham, of Bangor, is the chief promoter.

BESSEMER & LAKE ERIE.—Improvements to cost over \$1,500,000 have been begun. Of this sum, \$80,000 is to be used in enlarging the Greenville yards, and \$300,000 for additions to the shops at the same place. Over 12 miles of second track will be laid, and 140,000 steel ties will be used for new track and renewals.

BOSTON & MAINE.—This company, which proposes to double-track its road from Johnsonville, N. Y., southwest to Troy, 16 miles, has notified the State Railroad Commission that it proposes to abolish 19 grade crossings between these two points, and has asked the commission to determine in what manner the highways at these crossings shall cross the railroad.

CALIFORNIA MIDLAND.—A meeting is to be held April 5 by this company to issue stock to secure funds for building its proposed line from Marysville, Cal., east via Grass Valley to Nevada City, with a diverging line south to Auburn, Cal., a total of 55 miles. J. Martin is President and H. Malloch, Secretary.

CANADIAN NORTHERN.—Premier Pugsley has announced in the legislature that the Government was prepared to assist this company to build a line down the valley of the St. John river by guaranteeing four per cent. bonds to the extent of \$15,000 a mile. A bill to that effect may be laid before the legislature during the present session. As proposed, the line will be 132 miles long.

CANADIAN PACIFIC.—An official statement of the work to be carried out by this company this year, for which appropriations have been made, shows a total length of 958 miles of new railroad, including a large number of western branches and extensions. The principal work includes the completion of the Toronto-Sudbury line from Craighurst to Sudbury, Ont., 173 miles, and the extension of the Pheasant Hills branch to a junction with the Wetaskiwin branch, completing a through connection between the Calgary and Edmonton

line and the main line. In addition to the new lines about 326 miles of double-tracking remains to be done between Winnipeg and Fort William. This is to be finished; also 108 miles between St. Anne and Smiths Falls, Ont.

**CENTRAL OF OREGON.**—This company, which is building an extension from Union, Ore., northwest to La Grande, 45 miles, and which completed about seven miles last year, has bought a large quantity of rails, to be laid on its line from Union to Cove, and beyond that point to La Grande. Grading work is now under way on this section.

**CHATTANOOGA, WAYCROSS & JACKSONVILLE.**—Under this name a company is being organized to build a line from Waycross, Ga., north to Eastman, on the Southern Railway. The promoters include: John M. Cox, D. Lott, S. W. Hitch, J. S. Williams, W. B. Ellington, M. L. Moore, James Knox and Darren Lott, all of Waycross.

**CHICAGO, BURLINGTON & QUINCY.**—Plans for double-tracking the balance of this company's line between Kansas City and St. Joseph have been made. The line now has a double track between St. Joseph and Rushville, 15 miles, and between Beverly and Walrond, 13 miles. The second track for the remaining 32 miles will probably be laid this year.

**CINCINNATI INTERSECTING.**—Application has been made for a charter to build a belt line around Cincinnati, Ohio. The estimated cost of the right-of-way is \$800,000.

**CLEVELAND & SHARON TRACTION.**—To comply with the laws of Pennsylvania, which do not permit street railway companies to carry freight, this company has changed its plans to enter Sharon, Pa., from Orangeville. Engineers have been at work for some time securing another route. The plan is to run southeast from Orangeville through Brookfield township, and connect with the Mahoning & Shenango Valley, over which a traffic arrangement will be made for connection with Sharon. This will eliminate the heavy grades on the old route.

**CONSOLIDATED RAILWAY (N. Y., N. H. & H.).**—Plans have been announced for the building of trolley lines from Great Barrington, Mass., to South Egremont, and to Canaan, Conn. The line from Great Barrington to Canaan will closely parallel the Berkshire division of the New Haven.

**DAVENPORT & BURLINGTON INTERURBAN.**—Organized in Iowa with \$250,000 capital to build an electric line from Davenport, Ia., to Burlington, along the west shore of the Mississippi river. C. G. Hipwell, T. Dougherty and A. E. Carroll, all of Davenport, are interested.

**ERIE.**—The Directors have decided to stop work for the present on two new lines on which work has been under way in New York State. Under present conditions, the subsidiary companies doing the work are unable to dispose of their securities on favorable terms. The two lines are the Guymard cut-off, which is being built by the Erie & Jersey between Mount Hope and Highland Mills, 42 miles, and the low-grade single track line from Cuba on the Allegheny division to Hunts on the Buffalo division, 33 miles, which is being built by the Genesee River Railroad.

**EL PASO & SOUTHWESTERN.**—According to reports, the El Paso & Southwestern, which runs from El Paso, Tex., to Benson, Ariz., with a branch to Nacozari, state of Sonora, Mex., is to be extended from the last named point to Guaymas. Surveys were made sometime ago, and the right of way is now being cleared. The proposed extension will be about 300 miles long. The Sonora Railway now runs from Nogales to Guaymas.

**ERIE & JERSEY.** See Erie.

**GENESEE RIVER.** See Erie.

**GEORGIA ROADS.**—A company is being organized to build a line from Athens, Ga., northeast via Hartwell to Anderson, S. C., about 70 miles. The promoters include: Mayor Dorsey, W. L. Hodges, J. N. Webb, J. C. Cooper, J. White and G. C. Thomas, of Athens.

**GRAND TRUNK PACIFIC.**—Reports are current that this company is planning to build a line north from its proposed western terminus at Prince Rupert, B. C., via Skagway and other Alaska points into the Yukon district, with a branch to Juneau.

**HURON & ONTARIO (ELECTRIC).**—This company will let contracts about April 1 for building its proposed line between Toronto and Owen Sound. Surveys made and right of way partly secured. H. W. Middlemest, Toronto, Chief Engineer.

**ILLINOIS, IOWA & MINNESOTA.**—Work will shortly be started, it is said, on an extension of this road from its northern terminus at Rockford, Ill., northeast to Milwaukee, Wis., about 90 miles. An extension is also projected from the southern terminus at Momence to Gary.

**LAKE CHARLES & NORTHERN.**—See Southern Pacific.

**LOUISIANA ROADS.**—The City Council of New Iberia is negotiating with a committee from St. Martinville to build a line from New Iberia, La., to Port Barre, 35 miles, where a connection can be made with the Opelousas & Gulf. Preliminary surveys are to be made at once.

**MAINE ROADS (ELECTRIC).**—Bills have been introduced in the legislature to authorize the building of electric lines as follows: From Sanford, in York County, north via Parsonsfield to Hiram, 30 miles; Bethel northeast to Rumford Falls, 15 miles; Camden northwest to Liberty, 18 miles; Camden north to Belfast, 15 miles; Auburn west via Mechanic Falls, thence northwest to Norway, 20 miles; Lewiston south via Gray to Portland, 30 miles; Lisbon south via Durham to Freeport, 12 miles; Bangor southeast to a number of points in Hancock County; Ellsworth southeast to Bar Harbor on Mount Desert Island, 18 miles; on Peak Island; Danforth north via Houlton thence east to Woodstock, N. B., 50 miles; Presque Isle to Washburn; Presque Isle northeast via Fort Fairfield, thence east to Andover, N. B., 20 miles; Ellsworth east to Sullivan, 20 miles, and Ellsworth southwest to Castine, 22 miles.

**MARENGO & MIDLAND (ELECTRIC).**—Incorporated in Iowa with a capital of \$25,000, and office at Marengo. The company proposes to build electric lines north and south from Marengo, Ia., and also one east to Iowa City. W. E. Hibbs, H. Gods, H. H. Brimmer, W. J. Sayers and others are interested.

**MINEOLA, ROSLYN & PORT WASHINGTON TRACTION.**—A charter has been granted this company by the Nassau County (New York) Board of Supervisors, to build an electric line from the Long Island tracks at Main street, Mineola, via Roslyn to Port Washington, and thence along the Shore road. Work must be started within 60 days, and the entire line completed within six months. George Stanley, of Cleveland, Ohio, and other capitalists of that city are interested in the project. Additional franchises have been asked for lines to important towns on the south side of Long Island, making a total of about 100 miles.

**MOBILE, JACKSON & KANSAS CITY.**—According to reports, this company is planning to build two extensions; one from its present southern terminus at Mobile southwest to New Orleans, and another from Middleton, Tenn., north to Jopka, Ill., or to Paducah, Ky. President Robinson is quoted as saying that the extensions will be built and connections made with the Frisco and with the Rock Island.

**MONO LAKE.**—This narrow gage road, 32 miles long, in Mingo County, Cal., has been sold, it is reported, to the Brock Syndicate of Philadelphia, together with a large tract of timber land. The new owners are to make the line standard gage and build a connection with the Tonopah & Goldfield.

**MONTANA RAILROADS.**—A company is being organized by New York, Chicago, Helena and Butte capitalists to build an electric line from Helena, Mont., southwest to Butte, 55 miles, at a cost of about \$3,000,000. Power is to be secured from the Missouri river at Helena.

**NEW YORK, NEW HAVEN & HARTFORD.**—This company has bought the Poughkeepsie & Eastern, running from Poughkeepsie, N. Y., northeast 40 miles to Boston Corners, where it connects with the Harlem division of the New York Central. The road was owned by the late Russell Sage. It is parallel to a line of the Central New England, controlled by the New Haven, and is valuable chiefly for its terminal lands and rights in Poughkeepsie. The road has been operated at a deficit for some years and is in need of considerable improvement.

Negotiations are actively under way between this company and the officials of the city of Springfield, Mass., whereby the lands on which the railroad enters Springfield on the east side of the Connecticut river will be sold to the city of Springfield and the tracks transferred to the west side of the river. Work is to be begun immediately, building a new line west of the river from Warehouse Point northward to Springfield, 12 miles. The land acquired by the city is to be made into a river-front park, largely at the expense of two public-spirited citizens. When the change is made trains will run all the way from Hartford to Springfield on the west side of the river. The railroad will build a new bridge over the Connecticut river at Springfield.

**NEW YORK SUBWAYS.**—The Rapid Transit Board is planning to ask shortly for bids for the proposed subways on Seventh, Eighth and Lexington avenues.

Bids will be asked for early in April for the second section from Canal to Broome streets of the proposed bridge subway loop projected to connect the Brooklyn bridge with the Williamsburg bridge, in the Borough of Manhattan.

**OCEAN & NORTHERN.**—Application has been made for a charter under this name by a company with \$1,000,000 capital, to build a line from the harbor of Ellsworth, Me., or Winter Harbor, north

35 or 40 miles to Plantation No. 33. Incorporators include: E. H. Greeley, L. A. McGowan, J. A. Peters, H. W. Cushman and H. M. Hall, of Ellsworth, and B. E. Tracy, of Winter Harbor.

**OKLAHOMA & GOLDEN CITY.**—Residents of Jefferson City and of Golden City, Mo., are organizing a company under this name, to build a line from Jefferson City, Mo., southwest to Pawhusa, Okla., about 270 miles, with a branch from the main line at Climax Springs in Camden County, Mo., south to Springfield, 67 miles. The project has been under consideration for a number of years, and the promoters announce that they have arranged with eastern capitalists to finance the road. Contracts for surveys have been let.

**OREGON ROADS.**—Plans are being made for building a line from Holdman, Ore., to Columbia, about 15 miles, and eventually to extend south via Helix to Pendleton. E. W. McComas and G. A. Hartman, of Pendleton, are securing the right of way.

**ORFORD MOUNTAIN.**—The road is now completed from Rockland, Que., on the St. Francis river, near Brome, to Mansonville, on the Vermont border, about 70 miles, across the counties of Shefford and Brome. It is expected that the completed road will be opened for through traffic next week. The road connects with the Grand Trunk and the Canadian Pacific at its northern end, and with the Canadian Pacific and the Boston & Maine at its southern terminus.

**OWENSBORO & ROCKPORT TERMINAL & BRIDGE COMPANY.**—Organized in Owensboro, Ky., with \$1,000,000 capital to build a line from Owensboro north to Rockport, Ind., where connection is to be made with the Southern. There will have to be a bridge over the Ohio river. A. S. Kennedy, of Rockport, is President, and E. T. Franks, First Vice-President; F. A. Ames, Second Vice-President; J. H. Parrish, Treasurer, and J. F. Cox, Secretary, all of Owensboro, Ky.

**PORTLAND & RUMFORD FALLS RAILROAD.**—This company, a subsidiary of the Portland & Rumford Falls Railway, is asking permission to build from Poland, Me., south to the coast at Falmouth and at Portland, about 30 miles.

**POUGHKEEPSIE & EASTERN.**—See New York, New Haven & Hartford.

**RICHMOND & HAMILTON INTERURBAN.**—Organized to build an electric line from Richmond, Ind., southeast to Hamilton, Ohio, 40 miles. The project, it is said, has been financed, and rights of way are being secured. Henry Duhme, of Wyoming, Ohio, is the chief promoter. Cincinnati capitalists, including Attorney Caldwell, are also interested in the project.

**ST. MARY'S & WESTERN ONTARIO.**—Contracts have been let for building between St. Mary's and Embro, Ont., as follows: Rails, Dominion Steel Co., Sydney, C. B.; grading, ballasting, cement work, etc., J. E. Webb, Toronto; ties and telegraph poles, Victoria Harbor & Lumber Co., Toronto. (Mar. 15, p. 396.)

**SEABOARD AIR LINE.**—This company has secured trackage rights over the Southern from Atlanta to Macon, Ga., which will give a new and more direct route between Atlanta and Savannah, Ga. The present freight route of the Seaboard from Birmingham, Ala., Chattanooga and other points in the central south is through Atlanta and Columbia to Savannah, 425 miles. By the new route over the Southern between Atlanta and Macon, 88 miles, thence over the Macon, Dublin & Savannah, 92 miles, owned by the Seaboard, to Vidalia, then over the Seaboard to Savannah, 82 miles, making the total 262 miles, against 425 by the present route, and 295 miles over the Central of Georgia. In return the Seaboard grants to the Southern traffic arrangements to use the Seaboard's tracks from Macon to Savannah.

**SOUTHERN.**—See Seaboard Air Line.

**SOUTHERN PACIFIC.**—The Lake Charles & Northern, which was organized to carry out the work of the Louisiana & Pacific, formerly part of the Long-Bell Lumber Company's system of logging roads in Louisiana, is extending the line to connect De Ridder, on the Kansas City Southern, with Lake Charles, 44 miles. The narrow gage logging road, which is included in the above, extends from De Ridder to the Calcasieu river, about five miles north of Lake Charles. The line is being made standard gage and extended to Lake Charles.

**TEMISKAMING & NORTHERN ONTARIO.**—The Ontario Government has under consideration the question of building a branch line from Cobalt, Ont., to Sudbury. Preliminary surveys are being made. A private company has applied for a charter to build between these two points, but action on this application will be deferred until it is determined whether the government will build the line or not.

**TONOPAH & GOLDFIELD.**—This company, which is extending its road from Goldfield, Nev., to Bullfrog, is planning to build a branch line from Tonopah to the Silver Peak gold fields, about 20 miles.

**UNION PACIFIC.**—This company is planning to lay this summer about 260 miles of second main track on its main line between Omaha, Neb., and Green River, Wyo. According to Vice-President Mohler, work is under way on four new tracks between Omaha and

South Omaha. Double-track work between Julesburg, Neb., and Cheyenne, Wyo., will be delayed in order to finish the work at other points where traffic is heavier.

**WABASH.**—This company, the Pere Marquette and the Detroit Council Grade Separation Committee have agreed upon the plans for grade separation work between Twelfth street and the city limits, to cost \$1,250,000.

**WYANDOTTE & LAWRENCE.**—Incorporated in Kansas with \$510,000 capital to build from Lawrence, Kan., northeast via the counties of Douglas, Johnson, Leavenworth and Wyandotte to Kansas City, 38 miles. The directors include: J. E. Wherrell, B. Schnierle, F. K. Schuepbach, E. Y. Blum and H. C. Downs, all of Kansas City, Kan.

## RAILROAD CORPORATION NEWS.

**BANGOR & AROOSTOOK.**—This company has sold to a syndicate headed by Brown Bros., New York, \$1,000,000 5 per cent. bonds of branch lines; \$800,000 5 per cent., 30-year Northern Maine Seaport bonds, and \$900,000 serial equipment trust notes. (Nov. 2, 1906, p. 124.)

**BOSTON & PHILADELPHIA STEAMSHIP CO.**—See New York, New Haven & Hartford.

**DEEPWATER RAILWAY.**—A meeting of the stockholders of this company has been called for April 22, to vote on a proposition to merge the company with the Tidewater Railway. The Deepwater is building the West Virginia portion of the line. The Virginia Railway was recently incorporated to take over both these companies.

**ERIE.**—For retrenchment in construction work in New York State, see Railroad Construction columns.

**KANSAS CITY, MEXICO & ORIENT.**—This company recently sold \$1,500,000 bonds. Between 600 and 700 miles of road are now finished, and it is expected that by the end of the current year 1,200 miles will be completed.

**KANSAS CITY SOUTHERN.**—Gross earnings for February, 1907, were \$726,988, an increase of \$59,658; net earnings, \$308,933, an increase of \$131,071. Gross earnings for the eight months ended February 28, 1907, were \$5,900,217, an increase of \$954,752; net earnings \$2,377,156, an increase of \$1,101,772.

**MERCHANTS & MINERS' TRANSPORTATION CO.**—See New York, New Haven & Hartford.

**NEW YORK, NEW HAVEN & HARTFORD.**—The following details have been announced regarding the community of interest established between the New York, New Haven & Hartford and the Merchants & Miners' Transportation Co.: The railroad has agreed to exchange \$2,000,000 par value of its stock for \$2,500,000 par value of the capital stock of the steamship company. A special meeting of the stockholders of the last named company will be called to approve this transaction, to authorize an increase of \$3,000,000 in the capital stock, and to authorize an issue of \$3,250,000 4 per cent. debenture bonds. The bonds, it is understood, are to be given in exchange for the Boston & Philadelphia Steamship Co.; of the new stock, \$2,500,000 is to go to the New Haven and \$500,000 is to be distributed to the present stockholders of the steamship company. (March 15, p. 378.)

The New Haven has bought the Poughkeepsie & Eastern from the estate of the late Russell Sage for a price said to be \$400,000. The road runs from Poughkeepsie to Boston Corners, about 40 miles. It parallels the Central New England for about 20 miles from Poughkeepsie, and has terminals in Poughkeepsie, which will be valuable to the New Haven in connection with the rebuilding of the Poughkeepsie bridge.

**PHILIPPINE RAILROAD.**—The War Department will, about July 1, ask bids for \$1,000,000 4 per cent. bonds of the Philippine Railroad, which is being built on the island of Cebu. The Government does not guarantee the bonds, but they will have the same standing as other Philippine Government bonds, in that they can be deposited as security for public moneys in the treasury.

**POUGHKEEPSIE & EASTERN.**—See New York, New Haven & Hartford.

**TERRE HAUTE, INDIANAPOLIS & EASTERN TRACTION.**—This company has been incorporated by Philadelphia interests with \$25,000,000 stock and \$10,000,000 bonds as a holding company for the following electric lines in Indiana: The Indianapolis & Northwestern, the Indianapolis Western, the Indianapolis Coal Traction Co., the Indianapolis & Martinsville, the Indianapolis & Eastern, and the Richmond Street & Interurban.

**TIDEWATER RAILWAY.**—See Deepwater Railway.

**VIRGINIA RAILWAY.**—See Deepwater Railway.